DOCUMENT RESUME

ED 118 611 TM 005 098

AUTHOR	Ramsey-Klee, Diane M.; Richman, Vivian
TITLE	Further Investigations of Content Analytic Techniques for Extracting the Differentiating Information Contained in the Narrative Sections of Performarce Evaluations for Navy Enlisted Personnel. Technical Report No. 75-1.
INSTITUTION	R-K Research and System Design, Malibu, Calif.
SPONS AGENCY	Office of Naval Research, Washington, D.C. Personnel and Training Research Programs Office.
REPORT NO	TR-75-1
PUB DATE	Oct 75
NOTE	172p.
EDRS PRICE	MF-$0.83 HC-$8.69 Plus Postage
DESCRIPTORS	Classification; Comparative Analysis; *Content Analysis; Discriminant Analysis; *Enlisted Men; Military Personnel; Performance Criteria; *Performance Factors; *Personnel Evaluation; *Personnel Selection; Reliability; Validity
IDENTIFIERS	*Navy

ABSTRACT

The purpose of this research is to develop content analytic techniques capable of extracting the differentiating information in narrative performance evaluations for enlisted personnel in order to aid in the process of selecting personnel for advancement, duty assignment, training, or quality retention. Four tasks were performed. The first task was to cross-validate a short-cut indexing technique--the rational condensation method--on other occupational specialities and on other pay grades than those that had been studied earlier. In the second task, a reliability study was conducted in order to be certain that consistency among several indexers can be taught and achieved in their interpretation and application of the rational condensation short-cut method. A third task was undertaken in order to shed some light on whether it is reasonable to assume that although there may be slight differences between two indexers in how they apply a particular indexing procedure, a more important consideration is that they consistently use their own individualized interpretation of the indexing rules and conventions. In the fourth task, a careful comparison of the indexing, coding, keypunching, and subsequent computer processing time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to a small subsample of a data base was made. (Author/BJG)

Documents acquired by ERIC include many informal unpublished materials not available from other sources. ERIC makes every effort to obtain the best copy available. Nevertheless, items of marginal reproducibility are often encountered and this affects the quality of the microfiche and hardcopy reproductions ERIC makes available via the ERIC Document Reproduction Service (EDRS). EDRS is not responsible for the quality of the original document. Reproductions supplied by EDRS are the best that can be made from the original.

ED118611

TM

R-K RESEARCH AND SYSTEM DESIGN
3947 Ridgemont Drive
Malibu, California

Technical Report No. 75-1

FURTHER INVESTIGATIONS OF CONTENT ANALYTIC TECHNIQUES FOR EXTRACTING THE DIFFERENTIATING INFORMATION CONTAINED IN THE NARRATIVE SECTIONS OF PERFORMANCE EVALUATIONS FOR NAVY ENLISTED PERSONNEL

October 1975

Diane M. Ramsey-Klee, Ph.D.
Principal Investigator

Vivian Richman, M.L.S.
Research Associate

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

This research was sponsored by the
Personnel and Training Research Programs
Psychological Sciences Division
Office of Naval Research

Contract N00014-72-C-0231
Contract Authority Identification Number, NR 150-344

Reproduction in whole or in part is permitted
for any purpose of the United States Government.
Approved for public release; distribution unlimited.

TM005 098

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Report No. 75-1
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): Further Investigations of Content Analytic Techniques for Extracting the Differentiating Information Contained in the Narrative Sections of Performance Evaluations for Navy Enlisted Personnel

5. TYPE OF REPORT & PERIOD COVERED: Annual Technical Report (1 Jan 1974 - 31 Dec 1974)

6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): Diane M. Ramsey-Klee; Vivian Richman

8. CONTRACT OR GRANT NUMBER(s): N00014-72-C-0231

9. PERFORMING ORGANIZATION NAME AND ADDRESS: R-K Research and System Design, 3947 Ridgemont Drive, Malibu, California 90265

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 61153N; RR 042-04; RR 042-04-01; NR 150-344

11. CONTROLLING OFFICE NAME AND ADDRESS: Personnel and Training Research Programs, Office of Naval Research (Code 458), Arlington, Virginia 22217

12. REPORT DATE: October 1975

13. NUMBER OF PAGES: 160

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office):

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Appraisal of Performance	Personnel Selection
Content Analysis	Personnel Technology
Navy Evaluation Reports	Reliability
Performance Evaluation	Stepwise Discriminant Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

(U) The purpose of this continuing research effort is to develop content analytic techniques capable of extracting the differentiating information in narrative performance evaluations for enlisted personnel in order to aid in the process of selecting personnel for advancement, duty assignment, training, or quality retention. In the present study, four tasks were performed. The first task was to cross validate a short-cut indexing technique---the rational condensation method---on other occupational specialties and on other pay

(Continued)

grades than those that had been studied earlier. Stepwise discriminant analysis was used to determine how well the quantitative variables derived from the short-cut content analysis of the narrative text could classify each individual evaluated into correct criterion group. This investigation was intended to show if the rational condensation short-cut indexing procedure is generalizable (1) from AT's, BT's, CS's, and RM's to additional occupational specialties, and (2) from Pay Grade E7 to Pay Grades E5 and E6.

Using a subsample of the E5-E6 data base, a reliability study was conducted in order to be certain that consistency among several indexers can be taught and achieved in their interpretation and application of the rational condensation short-cut indexing method. In this second task, the level of agreement between each of the four reliability indexers and the experienced indexer who trained them was determined by the same statistical procedures (kappa, weighted kappa, and product-moment correlation) used in two earlier reliability studies in order that comparisons could be made among the three reliability studies of the magnitude of agreement achieved. This investigation was intended to lay the foundation for a training curriculum that may be used in the future to train Navy and civilian operational personnel in the application of the content analysis methodology.

The results of the first two reliability studies suggested the possibility that it may be as important to consider the issue of internal consistency for a single indexer as to measure the level of agreement that can be achieved among several indexers. It seems reasonable to assume that although there may be slight differences between two indexers in how they apply a particular indexing procedure, a more important consideration is that they consistently use their own individualized interpretation of the indexing rules and conventions. One then might expect that regardless of which individualized interpretation was used to index a particular data base, a similar level of classification agreement with the criterion of on-job performance could be achieved. This is an important area to study because the findings may point to the necessity to use only one indexer for a particular data base if optimum extraction of differentiating information is to be obtained. A third task was undertaken in order to shed some light on this issue by having a second indexer independently reindex two earlier data samples using the original lengthy indexing procedure. Thus, an exact replication of the indexing performed by the first indexer in her content analysis of these initial samples was carried out independently. The accuracy of classification into correct criterion group achieved by each of these two indexers was compared in order to determine if both indexers working separately with their own individualized interpretation of the indexing rules and conventions could achieve comparable classification results. In addition, the possibility that two indexers sharing the indexing of the same data base can achieve as good classification results as either indexer indexing the entire data base alone was explored.

In the fourth task, a careful comparison of the indexing, coding, keypunching, and subsequent computer processing time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to a small subsample of the E5-E6 data base was made. This comparison provides data needed for assessing the economic feasibility of adding information extracted from narrative comments into a composite score for predicting an enlisted man's potential for assuming the managerial responsibilities of the next higher pay grade.

CONTENTS

DD FORM 1473: REPORT DOCUMENTATION PAGE		iii
LIST OF FIGURES		vii
LIST OF TABLES		ix
ACKNOWLEDGMENTS		xiii
SUMMARY OF FINDINGS		xiv
SECTION 1	INTRODUCTION AND BACKGROUND	1
	The Pilot Study	1
	The Second Study	4
	The Third Study	5
	The Fourth Study	6
SECTION 2	CROSS VALIDATION OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE ON THE E5-E6 FLEET TRIAL DATA	9
	Introduction	9
	The First E5-E6 Fleet Trial Sample	12
	Derivation of the Quantitative Variables Used in the Stepwise Discriminant Analysis	13
	Results	13
SECTION 3	RELIABILITY STUDY OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE	45
	Introduction	45
	Methodology for the Reliability Study of the Rational Condensation Short-Cut Indexing Procedure	47
	Results	48
SECTION 4	VALIDATION OF THE ORIGINAL LENGTHY INDEXING PROCEDURE BY MEANS OF A SECOND INDEXER	53
	Introduction	53
	Methodology	53
	Results	54

SECTION 5	EFFICIENCY OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE COMPARED TO THE ORIGINAL LENGTHY INDEXING PROCEDURE	85
	Introduction	85
	Methodology	85
	Results	85
SECTION 6	FURTHER AREAS OF INVESTIGATION	95
REFERENCES		97
APPENDIX A	TRAINING MANUAL FOR INDEXING THE NARRATIVE SECTIONS OF NAVY PERFORMANCE EVALUATIONS FOR ENLISTED PERSONNEL	99
DISTRIBUTION LIST		155

LIST OF FIGURES

Figure 1	Evaluation Report Form NAVPERS 1616/8 (a 75 percent photo reduction of the original form)	3
Figure 2	Example of an Experimental First and Second Class Petty Officer Evaluation Report Form (a 75 percent photo reduction of the original form)	10
Figure 3	Accuracy of Classifying the Fleet Trial Sample 1 AD's (N=45) into Correct Criterion Group (Evaluation Section - 19R)	15
Figure 4	Accuracy of Classifying the Fleet Trial Sample 1 AD's (N=45) into Correct Criterion Group (Justification Section - 19S)	15
Figure 5	Accuracy of Classifying the Fleet Trial Sample 1 DC's (N=30) into Correct Criterion Group (Evaluation Section - 19R)	16
Figure 6	Accuracy of Classifying the Fleet Trial Sample 1 DC's (N=30) into Correct Criterion Group (Justification Section - 19S)	16
Figure 7	Accuracy of Classifying the Fleet Trial Sample 1 ET's (N=69) into Correct Criterion Group (Evaluation Section - 19R)	17
Figure 8	Accuracy of Classifying the Fleet Trial Sample 1 ET's (N=69) into Correct Criterion Group (Justification Section - 19S)	17
Figure 9	Accuracy of Classifying the Fleet Trial Sample 1 PN's (N=66) into Correct Criterion Group (Evaluation Section - 19R)	18
Figure 10	Accuracy of Classifying the Fleet Trial Sample 1 PN's (N=66) into Correct Criterion Group (Justification Section - 19S)	18
Figure 11	Accuracy of Classifying the Fleet Trial Sample 1 RM's (N=51) into Correct Criterion Group (Evaluation Section - 19R)	19
Figure 12	Accuracy of Classifying the Fleet Trial Sample 1 RM's (N=51) into Correct Criterion Group (Justification Section - 19S)	19

Figure 13	Accuracy of Classifying the Fleet Trial Sample 1 SK's (N=39) into Correct Criterion Group (Evaluation Section - 19R)	20
Figure 14	Accuracy of Classifying the Fleet Trial Sample 1 SK's (N=39) into Correct Criterion Group (Justification Section - 19S)	20
Figure 15	Accuracy of Classifying the Fleet Trial Sample 1 E5's (N=141) into Correct Criterion Group (Evaluation Section - 19R)	28
Figure 16	Accuracy of Classifying the Fleet Trial Sample 1 E5's (N=141) into Correct Criterion Group (Justification Section - 19S)	28
Figure 17	Accuracy of Classifying the Fleet Trial Sample 1 E6's (N=159) into Correct Criterion Group (Evaluation Section - 19R)	31
Figure 18	Accuracy of Classifying the Fleet Trial Sample 1 E6's (N=159) into Correct Criterion Group (Justification Section - 19S)	31

LIST OF TABLES

Table 1	Composition of the First 300-Case E5-E6 Fleet Trial Sample	12
Table 2	Definition of the 23 Quantitative Variables Derived from the Rational Condensation Indexing Form	14
Table 3	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 AD's (N=45) Using the Rational Condensation Short-Cut Indexing Procedure	22
Table 4	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 DC's (N=30) Using the Rational Condensation Short-Cut Indexing Procedure	22
Table 5	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 ET's (N=69) Using the Rational Condensation Short-Cut Indexing Procedure	23
Table 6	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 PN's (N=66) Using the Rational Condensation Short-Cut Indexing Procedure	23
Table 7	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 RM's (N=51) Using the Rational Condensation Short-Cut Indexing Procedure	24
Table 8	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 SK's (N=39) Using the Rational Condensation Short-Cut Indexing Procedure	24
Table 9	Recapitulation of the Classification Accuracy Achieved for the Six Occupational Specialties Represented in the First Fleet Trial Sample Using the Rational Condensation Short-Cut Indexing Procedure	25
Table 10	Arithmetic Mean of the Variable *Total Number of Words in Narrative Text* for Each of the Three Criterion Groups in Both the Evaluation and the Justification Sections Across All Samples Studied	26
Table 11	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 E5's (N=141) Using the Rational Condensation Short-Cut Indexing Procedure	29
Table 12	Best Classification into the Three Criterion Groups for the Fleet Trial Sample 1 E6's (N=159) Using the Rational Condensation Short-Cut Indexing Procedure	29

Table 13	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 AD's Using the Rational Condensation Short-Cut Indexing Procedure	32
Table 14	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 DC's Using the Rational Condensation Short-Cut Indexing Procedure	33
Table 15	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 ET's Using the Rational Condensation Short-Cut Indexing Procedure	34
Table 16	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 PN's Using the Rational Condensation Short-Cut Indexing Procedure	35
Table 17	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 RM's Using the Rational Condensation Short-Cut Indexing Procedure	36
Table 18	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 SK's Using the Rational Condensation Short-Cut Indexing Procedure	37
Table 19	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 E5's Using the Rational Condensation Short-Cut Indexing Procedure	39
Table 20	Variables Selected by the Stepwise Discriminant Analysis Program at Steps 1 Through 15 for the Fleet Trial Sample 1 E6's Using the Rational Condensation Short-Cut Indexing Procedure	40
Table 21	Summary of Variables Selected by the Stepwise Discriminant Analysis Program for the Six Occupational Specialties Represented in the First E5-E6 Fleet Trial Sample Arranged in Order by Frequency of Choice and Early Selection (Evaluation Section - 19R)	41
Table 22	Summary of Variables Selected by the Stepwise Discriminant Analysis Program for the Six Occupational Specialties Represented in the First E5-E6 Fleet Trial Sample Arranged in Order by Frequency of Choice and Early Selection (Justification Section - 19S)	42

Table 23	Level of Agreement Between the Experienced Indexer and Reliability Indexers A, B, X, Y, and Z in the Three Reliability Studies Conducted in 1972, 1973, and 1974	46
Table 24	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Cross Validation AT's (N=138) - Evaluation Section*	55
Table 25	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Cross Validation AT's (N=138) - Justification Section*	58
Table 26	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Cross Validation BT's (N=84) - Evaluation Section*	62
Table 27	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Cross Validation BT's (N=84) - Justification Section*	65
Table 28	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Generalization CS's (N=60) - Evaluation Section*	68
Table 29	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Generalization CS's (N=60) - Justification Section*	72
Table 30	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Generalization RM's (N=162) - Evaluation Section*	75
Table 31	Comparison of the Variables Selected at Each Step in the Stepwise Discriminant Analysis and the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure *Generalization RM's (N=162) - Justification Section*	78

Table 32	Recapitulation of the Classification Accuracy Achieved by the Various Indexers Using the Original Lengthy Indexing Procedure	82
Table 33	Efficiency of the Original Lengthy Indexing Procedure vs. the Rational Condensation Short-Cut Indexing Procedure on the Evaluation Section	86
Table 34	Efficiency of the Original Lengthy Indexing Procedure vs. the Rational Condensation Short-Cut Indexing Procedure on the Justification Section	88
Table 35	Results of the *t*-Tests of Mean Difference Between the Original Lengthy Indexing Procedure and the Rational Condensation Short-Cut Indexing Procedure on Efficiency of Indexing	89
Table 36	Estimated Costs of Content Analyzing a 100-Case Sample of E5-E6 Evaluation Reports by Two Indexing Procedures Preparatory to Computer Analysis	91
Table 37	Summary of the Various Subsamples That Will Have Been Analyzed at the Conclusion of This Basic Research Project	96

ACKNOWLEDGMENTS

This basic research project has continued to concern itself with the development and refinement of content analytic techniques capable of extracting the differentiating information in narrative performance evaluations for Navy enlisted personnel in order to aid in the process of selecting individuals for advancement, duty assignment, training, or quality retention. This technical report presents the findings resulting from the completion of four tasks. These continuing investigations being conducted under the auspices of this project are sponsored by the Personnel and Training Research Programs, Psychological Sciences Division, directed by Marshall J. Farr, Ph.D. The Navy Personnel Research and Development Center (NPRDC), San Diego, provided the data bases used in this research. The continuing support by ONR and the cooperation from NPRDC are gratefully acknowledged.

This report was reviewed by David W. Robertson and Marjorie H. Royle of NPRDC prior to its reproduction and distribution. Their valuable suggestions have been incorporated into the final product.

The stepwise discriminant analyses were performed at the UCLA Health Sciences Computing Facility. This facility operates under the directorship of Wilfrid J. Dixon, Ph.D., and is sponsored by NIH Special Research Resources Grant RR-3. All of the agreement statistics calculated for the three inter-indexer reliability studies were performed on the Olivetti P602 microcomputer at R-K Research and System Design.

The indexing of the first E5-E6 fleet trial sample was performed by Vivian Richman, M.L.S., using the rational condensation short-cut indexing procedure that she had developed a year earlier. She also trained the four reliability indexers who participated in the reliability study of the rational condensation short-cut indexing method. In addition, she conducted the time studies in which the efficiency of the rational condensation short-cut indexing procedure was compared to the original lengthy indexing procedure. The training manual for the rational condensation short-cut indexing procedure reproduced in Appendix A also is her work. Her continuing intellectual contributions to the successful development and documentation of content analytic techniques for analyzing narrative performance evaluations are substantial and deserve special mention.

Jonnie Handley was the second indexer to independently index two earlier samples of narrative performance evaluations for senior enlisted personnel in Pay Grade E7. She also served as Reliability Indexer A as well as performing all of the statistical calculations for the reliability study of the rational condensation short-cut indexing method. Her dedicated and conscientious performance of her part of this research is acknowledged with gratitude.

Diane M. Ramsey-Klee, Ph.D.
Principal Investigator

SUMMARY OF FINDINGS

A great deal of differentiating information in narrative comments on performance evaluation forms that could substantially aid in selecting personnel for advancement, duty assignment, training, or quality retention is not being exploited in any systematic manner because narrative text resists easy analysis. Therefore, a series of studies has been conducted, all aimed at developing and refining content analytic techniques capable of extracting the differentiating information in narrative performance evaluations for enlisted personnel. In the fourth study being reported here, four tasks were undertaken: (1) to cross validate the superior short-cut indexing technique developed earlier---the rational condensation method---on other occupational specialties and on other pay grades than those that had been studied previously, (2) to conduct a third reliability study to be certain that consistency among several indexers can be taught and achieved in their interpretation and application of the rational condensation short-cut indexing method, (3) to reindex two earlier samples of narrative comments using the original lengthy indexing procedure and a second indexer to compare the accuracy of the two indexers in classifying senior enlisted personnel into correct criterion groups based on job performance marks in order to determine if both indexers working separately with their own individualized interpretation of the indexing rules and conventions could achieve comparable classification results and if two indexers sharing the indexing of the same data base can achieve as good classification results as either indexer indexing the entire data base alone, and (4) to compare the time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to a small sample of Evaluation Reports.

Cross Validation of the Rational Condensation Short-Cut Indexing Procedure on the E5-E6 Fleet Trial Data

The next step in this research was to cross validate the better of two short-cut indexing techniques used in classifying three E7 data bases studied earlier on other occupational ratings and on other pay grades. A set of usable fleet trial data, including criterion data, were available at the Navy Personnel Research and Development Center (NPRDC) that had been generated in the process of testing a number of experimental forms for measuring on-job performance for Pay Grades E5 and E6 in seven occupational specialties. A 300-case sample of Evaluation Reports representing six of the seven occupational specialties in the E5-E6 fleet trial data base was selected, including Aviation Machinists Mate (AD), Damage Controlman (DC), Electronics Technician (ET), Personnelman (PN), Radioman (RM), and Storekeeper (SK). A set of 23 quantitative variables was derived from the rational condensation short-cut indexing form used in the content analysis of the E5-E6 fleet trial narrative performance evaluations. Profiles or vectors of these 23 variables were constructed for all of the Evaluation Reports contained in the 300-case fleet trial sample, separate profiles being compiled for the Evaluation Section and the Justification Section of each Evaluation Report. These profiles then were subjected to stepwise discriminant analysis.

In the analysis of narrative comments contained in the Evaluation Section and the Justification Section for each of the six occupational specialties represented in the 300-case E5-E6 fleet trial sample, approximately half or more of the cases were classified into correct criterion group at the very first step in the stepwise discriminant analysis process. After the first step, classification performance continued to climb slowly but asymptotically. However, perfect classification performance was not achieved for any of the six occupational specialties on either section of narrative comments, although classification accuracy ranged from 67 to 90 percent. In earlier content analysis studies at the E7 pay grade level, better classification performance was achieved than in this sample. However, at the lower pay grades there typically are fewer words in the narrative text of justification comments. If fewer words also indicate less substantive content, then there is less potentially differentiating information in the narrative comments written by evaluators for enlisted personnel in Pay Grades E5 and E6.

Several reasons may help explain these results. First, in the lower pay grades job duties which are less demanding, more routine, and not so managerial in nature may produce less critical observational data and narrative comments that lack the necessary substance to differentiate between good and superlative first and second class petty officers, evidenced by substantially fewer words in the narrative text for justification comments at the lower pay grades. Second, the sample sizes in the six occupational specialties represented in the E5-E6 fleet trial sample are quite small in comparison to those studied earlier. Third, the six occupational specialties represented in the E5-E6 fleet trial sample may constitute job categories that afford less differentiating performance data than the four occupational specialties represented in the E7 samples studied earlier.

Classification results on the Evaluation Section were comparable in the two samples for the one occupational specialty in common in the E5-E6 and E7 samples---Radioman (RM). However, better classification accuracy was achieved on the Justification Section for the E7 RM's, probably because of the lengthier narrative text in justification comments at the higher pay grade level.

As in earlier research, better classification using the stepwise discriminant analysis procedure was achieved on the E5-E6 fleet trial sample by analyzing each occupational specialty separately rather than by combining all of the occupational specialties represented in a sample.

Most of the misclassifications made by the stepwise discriminant analysis procedure, as judged by the criterion of on-job performance, were in the direction of classifying an individual into a lower criterion group than the one to which he actually belonged. Since the criterion of on-job performance is imperfect, the stepwise discriminant analysis procedure appears to sift out the individuals who might have been assigned to a higher criterion group because of inflated marks. Application of this statistical technique would help to narrow the field of candidates for advancement, duty assignment, training, or quality retention to only those individuals potentially the most qualified.

An examination of the variables selected by the stepwise discriminant analysis program for the first 15 steps in each of the computer runs reveals a particularly interesting set of results since most of the classification

problem is solved in the early steps of the stepwise discriminant analysis. For both sections of narrative comments all 23 quantitative variables derived from the rational condensation short-cut indexing procedure were selected within the first 15 steps by at least one occupational specialty, suggesting that all variables used in the stepwise discriminant analysis have something to contribute to solving the classification problem. A particularly differentiating variable is Total Number of Index Terms Used. In earlier content analysis studies at the E7 pay grade level, *without exception* the first variable selected for the Justification Section was Total Number of Index Terms Used, reflecting the variety of specific areas of an individual's performance that the evaluator chose to comment on, and indicating that the range of skills and abilities that a chief petty officer manifests is a key factor in his superior performance. At the E5-E6 pay grade levels, Total Number of Index Terms Used is a key discriminating variable in both the Evaluation Section and the Justification Section.

The number and type of adjectives and adverbs that an evaluator uses to describe the performance of the individual (as reflected in the various weights assigned to index terms) do not appear to contribute very much to differentiating among superlative first and second class petty officers and their slightly less qualified peers, whereas at the E7 pay grade level (chief petty officers) these weights are important discriminators. There appears to be less critical observational data available at the lower pay grades upon which to base a performance evaluation as reflected in shorter narrative comments on the Justification Section.

When both sections of narrative comments are considered together, the more discriminating variables seem to be Total Number of Index Terms Used, Cooperation and Responsiveness, Endurance and Motivation, Productivity and Achievement, Intellectual Functioning, Recognition, and Total Number of Words in Text. At Pay Grades E5 and E6, it seems reasonable that a petty officer's cooperative and responsive spirit, his endurance and motivation, his productivity and achievement, his level of intellectual functioning, and the amount of recognition he receives for his on-job performance would be more significant variables than leadership and management qualities that will be brought into play later in his career as he advances through the pay grade structure from junior to senior enlisted petty officer.

Reliability Study of the Rational Condensation Short-Cut Indexing Procedure

A new training manual was prepared to explain and illustrate the proper utilization of the rational condensation short-cut indexing procedure. Four reliability indexers were trained by the experienced indexer over the course of six sessions in the application of this procedure using the training manual. These four indexers then independently indexed the narrative comments contained in a newly selected subset of 48 Evaluation Reports taken from the E5-E6 fleet trial data base. Once again, the Evaluation Section was separated from the Justification Section, resulting in a group of 96 randomized pieces of narrative text---*minidocuments*---that were indexed independently by each reliability indexer. Their indexing decisions then were compared to those of

the experienced indexer who trained them and whose decision-making processes they were trying to emulate. The same agreement statistics that were used in the two previous reliability studies (kappa, weighted kappa, and product-moment correlation) were computed in order to determine if the reliability of the rational condensation short-cut indexing procedure is comparable to that found in the two earlier reliability studies of the original lengthy indexing procedure. The value of the various agreement statistics ranged from .73 to .90 in this third reliability study, excluding the results for one reliability indexer who suffered a whole host of personal problems during the course of the study that directly affected her indexing performance.

Thus, consistency among several indexers in their interpretation and application of the rational condensation short-cut indexing procedure to the narrative comments contained in performance evaluations for naval enlisted personnel is high and better than that achieved with the lengthy indexing procedure in two earlier reliability studies. In the 1972 and 1973 reliability studies of the lengthy indexing procedure, better agreement with the experienced indexer was exhibited in the selection of index terms compared to the assignment of weights to these terms based on the modifying adjectives and adverbs used by an evaluator. In the 1974 reliability study of the rational condensation short-cut indexing procedure, agreement with the experienced indexer was approximately the same for the selection of index terms and the assignment of weights to these terms. In all three reliability studies, quite respectable levels of agreement between the experienced indexer and the various reliability indexers were achieved in only six training sessions, indicating that Navy and civilian operational personnel also should be able to learn to consistently apply the content analytic techniques developed in this research project.

Validation of the Original Lengthy Indexing Procedure by Means of a Second Indexer

The results of the first two reliability studies suggested that it may be as important to consider the issue of internal consistency for a single indexer as to measure the level of agreement that can be achieved among several indexers. Although two indexers may differ slightly in how they apply a particular indexing procedure, it may be more important that they consistently use their own individualized interpretation of the indexing rules and conventions. Regardless of the individualized interpretation used to index a particular data base, a similar level of classification agreement with the criterion of on-job performance might be achieved. In order to shed some light on this issue, a second indexer independently reindexed the cross validation and generalization samples using the original lengthy indexing procedure. The accuracy of classification into correct criterion group achieved by each of these two indexers was compared. In addition, the possibility that two indexers sharing the indexing of the same data base can achieve as good classification results as either indexer indexing the entire data base alone was explored.

Regardless of which individualized interpretation of the indexing rules and conventions was used to index a particular data base of narrative performance evaluations, a similar level of classification agreement with the cri-

terion of on-job performance was achieved. Furthermore, it can be concluded that two indexers sharing the indexing of the same data base can be expected to achieve as good classification results as either indexer indexing the entire data base alone. Therefore, there appears to be no necessity to use only one indexer for a particular data base in order to obtain optimum extraction of differentiating information, assuming that indexers are well trained to begin with and conscientious in applying the indexing rules and conventions to the best of their ability.

Efficiency of the Rational Condensation Short-Cut Indexing Procedure Compared to the Original Lengthy Indexing Procedure

Although the rational condensation short-cut indexing procedure in earlier studies did not achieve the classification accuracy of the original lengthy indexing procedure, it did achieve an acceptable level of classification performance. It is much easier to apply and appears to be slightly more reliable since there are fewer areas of ambiguity, resulting in more consistent interpretation of the indexing rules and conventions. Therefore, an important consideration is how efficient each of these two indexing procedures is for indexing a particular sample of Evaluation Reports. This kind of comparison can provide data needed for assessing the economic feasibility of adding information extracted from narrative comments into a composite score for predicting an enlisted man's potential for assuming the managerial responsibilities of the next higher pay grade.

A subsample of 12 Evaluation Reports taken from the E5-E6 fleet trial data base was selected. The time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to this 12-case subsample was compared. Taken into account in the comparison was the time required by both indexing procedures (1) to index the narrative text for the Evaluation Section and the Justification Section, (2) to enter the resulting indexing decisions onto the indexing form, (3) to code the data recorded on the indexing forms onto IBM coding sheets, (4) to keypunch the IBM coding sheets, and (5) to keyverify the IBM coding sheets. The computer processing time required by each of the two indexing procedures also was considered.

In order to arrive at some estimate of the comparative costs of applying the two indexing procedures to a typical 100-case sample of E5-E6 Evaluation Reports, cost estimates were prepared based on the time required per case to perform all of the steps in the content analysis of the narrative text up to the point of computer analysis. The cost comparison suggested that the rational condensation short-cut indexing procedure can be applied for about 60 percent of the cost of applying the lengthy indexing procedure to the same corpus of narrative text. The difference in cost in favor of the short-cut indexing procedure for the computer analysis is insignificant, amounting to only two or three dollars for a sample size of around 100 cases. Since little is lost in classification accuracy by using the short-cut indexing procedure, the economic advantage of this indexing method opts in its favor. The only justification for using the longer, more complex indexing methodology might be in situations where it was expected that discrimination between criterion groups would be extremely difficult to achieve.

SECTION 1. INTRODUCTION AND BACKGROUND

The purpose of this continuing research investigation has been to complement the Navy Personnel Research and Development Center (NPRDC), San Diego, in their efforts to develop effective procedures for improving the validity of individual personnel selection decisions based on accurate measures of job-relevant performance. NPRDC has an ongoing program to develop and exploit Navy enlisted performance evaluation formats which will be effective in holding down the pile-up of marks at the high end of the marking scale and in achieving a distribution of marks that tapers off sufficiently at the high end of the scale in order to permit greater differentiation, thus making evaluations more useful, especially when small selection opportunities are involved.[1,2,3] An accurate and timely measure of each individual's on-job performance is essential if valid decisions are to be made in selecting personnel for advancement, duty assignment, training, or quality retention. Such a measure is one of the best indications of how well the individual will perform in other or future assignments. However, effective use of performance measures is severely limited due to the lack of performance data in formats responsive to the needs of the decision makers. The problem is particularly acute when these decision makers are members of selection boards who must review in a short span of time narrative evaluation data for thousands of candidates. The seriousness of this problem can be attested to by the fact that some 14,000 candidates for promotion must be reviewed annually by the E8-E9 selection board. This number represents the top 75 percent of all candidates, the lower 25 percent having been eliminated by a screening procedure. The problem is even more serious at the lower pay grades. An E7 selection board was established in 1973 whose task is to review annually the records of some 20,000 enlisted candidates for promotion to chief petty officer. This number of candidates represents the top 50 percent of the eligible population, the bottom 50 percent having been eliminated by a screening procedure.

The workload facing these selection boards is massive and to date narrative comments on the performance evaluation forms have not been exploited in any systematic manner because narrative text resists easy analysis. Yet there seems to be a great deal of differentiating information in these narrative comments that could substantially aid selection boards in choosing the most qualified candidates for promotion. This, then, was the task that R-K Research and System Design took on in an initial pilot study.

The Pilot Study

In the pilot study of the narrative sections of 224 Navy performance evaluations for senior enlisted personnel in Pay Grade E7, it was determined by content analytic techniques that it is possible to differentiate between the performance of typical and superlative chief petty officers based on the substantive content of Evaluation Reports.[4] The results of this pilot study strongly suggested that there are stable differences among the performance characteristics of chief petty officers in the various portions of the upper half of the marking scale on Performance of Duty that are reflected in narrative statements written by evaluators. Prior to embarking on the initial pilot study, it was assumed that differences in marks between the upper and

lower halves of the marking scale were readily reflected in narrative statements. However, in order to address the study to the realities and difficulties facing selection boards, who must make their selections only from a uniformly high quality group of candidates, NPRDC provided R-K Research and System Design with a truncated data set comprising individuals marked only in the upper half of the marking scale. The sample data then were divided into three criterion groups---Upper, Middle, and Lower---corresponding to three portions of the upper half of the marking scale on Performance of Duty (the criterion variable). This truncated data set required a much more rigorous analytical approach than would have been required for a nontruncated data set.

In the pilot investigation, NPRDC selected a sample of 224 Evaluation Reports for senior enlisted personnel in Pay Grade E7, including 144 Aviation Electronics Technicians (AT's) and 80 Boiler Technicians (BT's). All 224 Evaluation Reports were drawn from the top half of the marking scale on 19A-PERFORMANCE OF DUTY of Evaluation Report Form NAVPERS 1616/8 (see Figure 1). This form subsequently has been replaced by another form that can be scanned by an optical character reader; however, the content of the two forms is essentially the same. The pilot study sample of 224 Evaluation Reports was selected to contain three discontinuous criterion groups corresponding to the Upper, Middle, and Lower portions of the upper half of the marking scale on 19A-PERFORMANCE OF DUTY.

An indexing vocabulary consisting of 29 descriptive labels was devised to encompass the substantive content of the narrative sections of Evaluation Reports. These 29 index terms fell into three major areas---MANAGEMENT FUNCTIONS, SKILLS AND ABILITIES, and PRODUCTIVITY AND ACHIEVEMENT. Under each of these headings there were more detailed terms such as PLANNING, TECHNICAL SKILLS, and AWARDS AND PUNISHMENT, providing the indexer with a 3-level hierarchy of descriptive labels from which to choose. Each sentence of narrative text in the pilot study sample was read carefully and, where appropriate, divided into segments corresponding to the assignment of specific index terms. However, it is not enough to simply label a narrative statement with the most appropriate index term since the statement may have been a highly positive, quite positive, neutral, quite negative, or highly negative one. Therefore, a weighting scale containing six degrees of favorableness/unfavorableness was devised based on the range of adjectives and adverbs that occur in narrative text of this kind. The indexing procedure that was used was the following: The narrative text of each Evaluation Report was read, segmented into distinct statements, and each statement was assigned one or more index terms from the set of 29 possible choices. Each term selected also was assigned a numerical weight from +3 to -2 depending upon the nature of the adjectives or adverbs used as modifiers in the statement. When the entire narrative text of the Evaluation Report had been indexed, the indexing decisions that had been made were recorded on a special indexing form. A set of 67 quantitative variables subsequently was derived from the indexing form used to record the content analysis decisions. Profiles or vectors of these 67 values then were prepared for all of the Evaluation Reports contained in the pilot study sample. Separate profiles were compiled for the Evaluation Section (19R) and the Justification Section (19S) of each Evaluation Report. The statistical analyses that were performed on the quantitative data extracted from the pilot study content analysis supported the hypothesis that narrative performance evaluations do contain information useful to personnel selection boards in discriminating between typical and superlative chief petty officers.

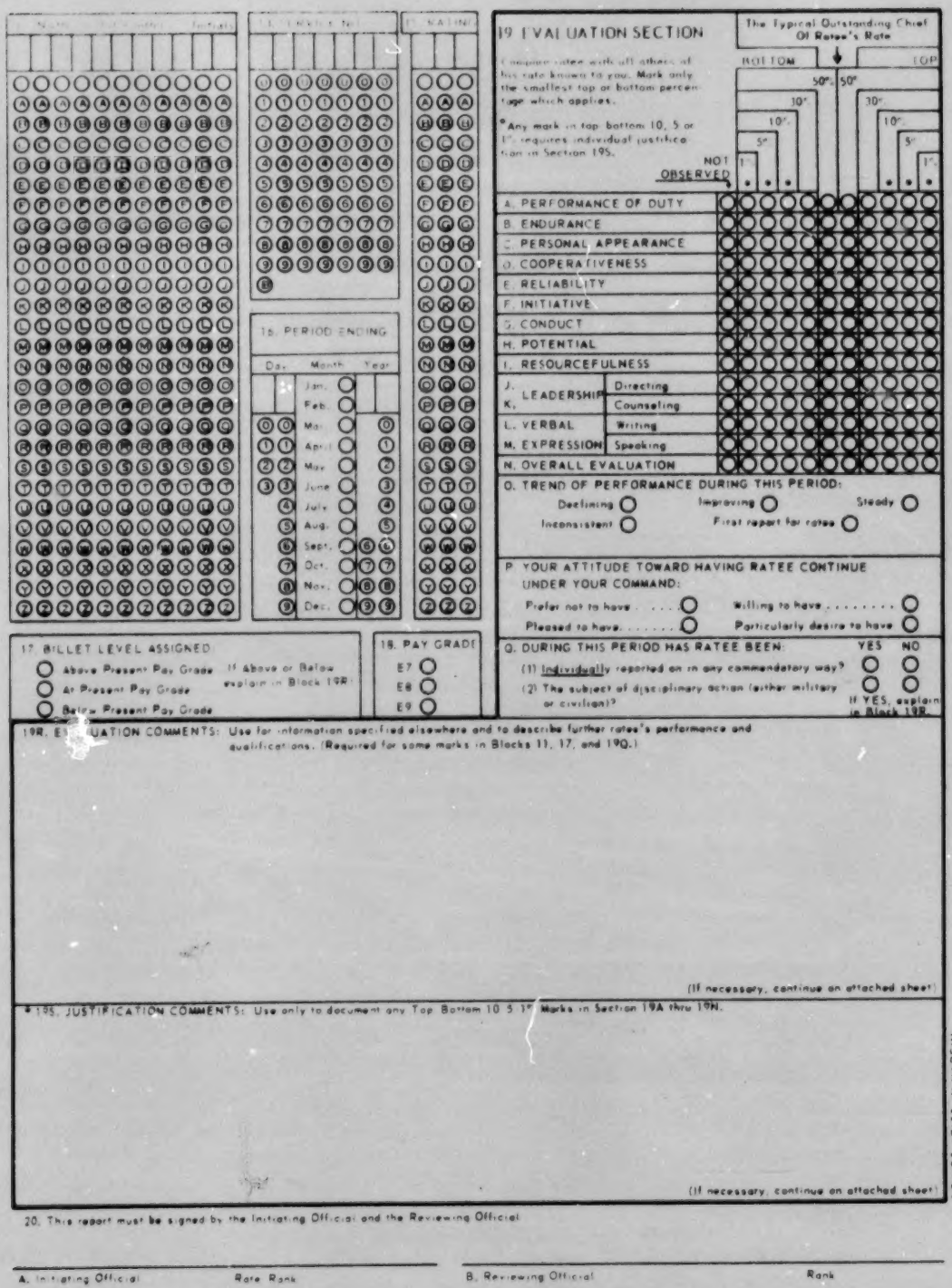


Figure 1. Evaluation Report Form NAVPERS 1616/8 (a 75 percent photo reduction of the original form).

The Second Study

The findings from the pilot study were considered to be provocative enough to warrant further investigation. Therefore, a second study was embarked upon to attempt to cross validate the pilot study results on 222 new Evaluation Reports for senior enlisted men in the same two occupational specialties (138 AT's and 84 BT's) that were represented in the pilot study sample and to extend the content analysis to 222 Evaluation Reports for senior enlisted men in two different occupational specialties (60 Commissarymen [CS's] and 162 Radiomen [RM's]) than those investigated in the pilot study in order to test the generalizability of the content analytic techniques developed earlier.[5] As a further refinement, the cross validation and generalization samples of Evaluation Reports were analyzed without any knowledge of the individual's relative position in the upper half of the marking scale on Performance of Duty (the criterion variable). In the pilot study the criterion data were made available early in the study, thus introducing the possibility that this knowledge subconsciously might have influenced the content analysis that was performed. This factor was controlled for in the second study by withholding the criterion information until the content analysis of the narrative text had been completed.

In the second study a series of more sophisticated and comprehensive statistical analyses was performed on the quantitative data extracted from the content analysis, resulting in the following important findings. It was possible to index the cross validation sample in the blind, without knowledge of criterion group membership, and achieve as good classification accuracy as was achieved with the pilot study sample where criterion group membership was known to the indexer. Further, it was shown that better classification into the three criterion groups was achieved when the two occupational specialties represented in the pilot study sample and the cross validation sample were treated separately. These findings suggest that classification procedures based on the content analysis methodology developed in this research should be tailored to specific occupations. In addition, it was shown that the content analysis methodology developed initially on the pilot study sample consisting of AT's and BT's was generalizable to a new sample consisting of two different occupational specialties, viz., CS's and RM's.

Also of concern in the pilot study were the issues of reliability and trainability, although the scope of the small initial research effort did not permit these aspects to be studied in any substantial way. Therefore, in designing the second investigation these issues were dealt with by including a reliability study whose objectives were twofold: (1) to determine the level of agreement between pairs of individuals both of whom independently would perform a content analysis of the same corpus of Evaluation Reports, and (2) to investigate if nonresearchers could be trained successfully to apply the complex, lengthy indexing procedure developed in the pilot study.[5] Kappa, weighted kappa, and product-moment correlation were the three statistics used to measure agreement between the experienced indexer and two reliability indexers in their assignment of index terms and weights to the narrative text of a small corpus of Evaluation Reports. The value of the various agreement statistics that were computed ranged from .62 to .89 in this first reliability study. The initial expectation was that it would be extremely difficult to

train nonresearch-oriented individuals to consistently index the narrative sections of Evaluation Report forms using the complex content analysis methodology that had been developed in the pilot study. The surprising result was that in only six training sessions a quite respectable level of agreement was achieved. This is a significant finding because it suggests that Navy and civilian operational personnel also can be trained to consistently apply content analytic techniques.

The Third Study

In a follow-on investigation[6] to the pilot study and the second study, two tasks were performed. The first task was to try to develop valid, short-cut methods of indexing the narrative content of Evaluation Reports that would extract the differentiating information contained in evaluative comments in a simple but reliable fashion, hopefully achieving as good or nearly as good classification accuracy as the longer, more complex indexing procedure developed initially. Two short-cut methods of indexing the narrative content of Evaluation Reports were developed, one a rational condensation of the entire original hierarchy of 29 index terms into a new set of 15 compressed terms, and the other a 15-term subset of the original hierarchy of 29 terms chosen on the basis of their early selection by the stepwise discriminant analysis process. The two short-cut indexing methods, although not achieving the classification accuracy of the original lengthy indexing procedure which had more variables available for the stepwise discriminant analysis process, did, however, achieve an acceptable level of classification performance in comparison to the longer, more complex indexing methodology. Of the two short-cut methods, the rational condensation indexing method was preferred since it tracked the lengthy method more faithfully in the selection of discriminating variables. Further, the rational condensation method examines *all* of the information contained in a narrative performance evaluation whereas the statistically selected subset method ignores certain portions of the narrative text.

The key variables in differentiating between the performance of superlative chief petty officers and their slightly less qualified colleagues were the adjectives and adverbs that an evaluator uses to describe the performance of the individual that is being evaluated; the range of skills and abilities that an individual manifests; and the following specific demonstrated capabilities: Management and supervisory ability; skill in leading and directing his men; ability to organize his work area and to staff it properly; ability to plan his workload and take any corrective measures necessary to compensate for unforeseen obstacles to good performance; the ability to present an effective image of his work force to other components of the Navy and to the civilian community; skill in communicating effectively with others; a cooperative and responsive way of performing his job duties; a creative, resourceful, and innovative approach to his work; the drive and stamina to perform well under tiring or adverse circumstances; his level of intellectual functioning; professional and technical competence in his occupational specialty; his level of productivity and achievement; and recognition of his assets and potential by his subordinates, peers, and superior officers.

In the second task performed as part of the follow-on investigation to the pilot study and the second study, the original inter-indexer reliability study was extended in order to elucidate more fully the issue of reliability of the complex, lengthy indexing procedure. In the extension of the reliability study, the various agreement statistics ranged from .56 to .83, similar in magnitude to the results obtained in the first reliability study. Once again, the heartening finding was that in only six training sessions a quite respectable level of agreement among indexers was achieved.

The Fourth Study

The obvious next step in this research was to cross validate the superior short-cut indexing technique---the rational condensation method---on other occupational specialties and on other pay grades than those that had been studied earlier (viz., AT's, BT's, CS's, and RM's in Pay Grade E7). During calendar year 1974, the narrative sections of a sample of 300 Evaluation Reports for enlisted personnel in Pay Grades E5 and E6 were indexed using the rational condensation short-cut method. This data base consisted of performance evaluations on enlisted personnel in six occupational specialties, only one of which (Radioman) overlapped the four occupational specialties already studied:

	N
AD - Aviation Machinists Mate	45
DC - Damage Controlman	30
ET - Electronics Technician	69
PN - Personnelman	66
RM - Radioman	51
SK - Storekeeper	39
TOTAL	300

Stepwise discriminant analysis was used to determine how well the quantitative variables derived from the short-cut content analysis of the narrative text could classify each individual evaluated into correct criterion group. Each of the six occupational specialties represented in the sample and each of the two pay grades were analyzed separately. This investigation was intended to show if the rational condensation short-cut indexing procedure is generalizable to Pay Grades E5 and E6 and to occupational specialties other than those studied thus far. The results of this investigation are presented in Section 2.

Using a subsample of the E5-E6 data base, a third reliability study was conducted in order to be certain that consistency among several indexers can be taught and achieved in their interpretation and application of the rational condensation short-cut indexing method. The level of agreement between each of the four reliability indexers and the experienced indexer who trained them was determined by the same statistical procedures used in the two earlier reliability studies in order that comparisons could be made among the three

reliability studies of the magnitude of agreement that was achieved. This investigation was intended to lay the foundation for a training curriculum that may be used in the future to train Navy and civilian operational personnel in the application of the content analysis methodology. The results of the third reliability study are presented in Section 3.

The results of the first two reliability studies suggested the possibility that it may be as important to consider the issue of internal consistency for a single indexer as to measure the level of agreement that can be achieved among several indexers. It seems reasonable to assume that although there may be slight differences between two indexers in how they apply a particular indexing procedure, a more important consideration is that they consistently use their own individualized interpretation of the indexing rules and conventions. One then might expect that regardless of which individualized interpretation was used to index a particular data base, a similar level of classification agreement with the criterion of on-job performance could be achieved. This is an important area to study because the findings may point to the necessity to use only one indexer for a particular data base if optimum extraction of differentiating information is to be obtained.

In order to shed some light on this issue, a second indexer independently reindexed the cross validation and generalization samples using the original lengthy indexing procedure. Thus, an exact replication of the indexing performed by the first indexer in her content analysis of the cross validation and generalization samples was carried out independently. The accuracy of classification into correct criterion group achieved by each of these two indexers was compared in order to determine if both indexers working separately with their own individualized interpretation of the indexing rules and conventions could achieve comparable classification results. In addition, the possibility that two indexers sharing the indexing of the same data base can achieve as good classification results as either indexer indexing the entire data base alone was explored. The findings from these comparisons are discussed in Section 4.

A careful comparison of the indexing, coding, keypunching, and subsequent computer processing time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to a small subsample of the E5-E6 data base was made. This comparison provides data needed for assessing the economic feasibility of adding information extracted from narrative comments into a composite score for predicting an enlisted man's potential for assuming the managerial responsibilities of the next higher pay grade. The results of this analysis are described in Section 5.

In Section 6 the areas of investigation to be undertaken in the final year of this research project are identified.

SECTION 2. CROSS VALIDATION OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE ON THE E5-E6 FLEET TRIAL DATA

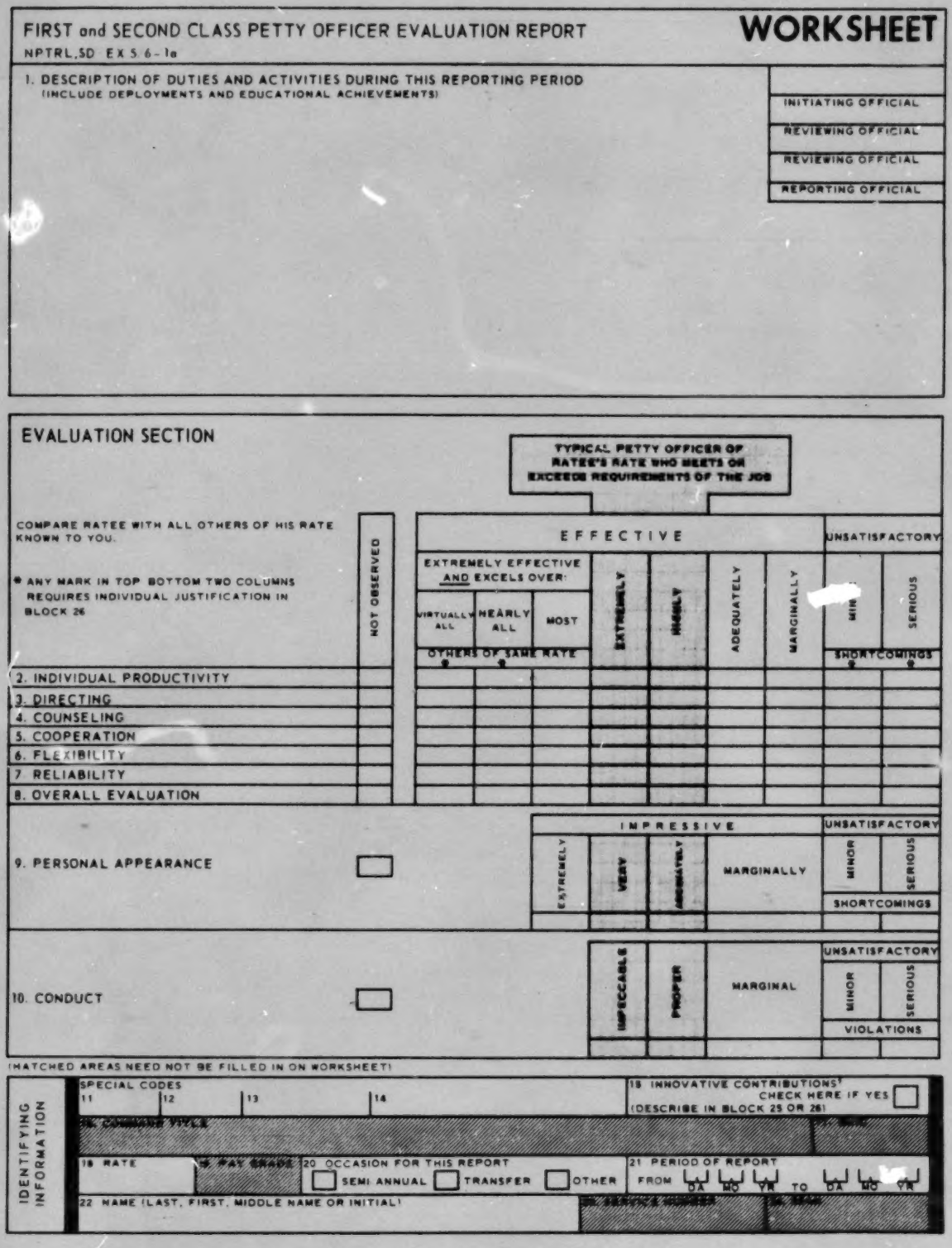
Introduction

In a previous study undertaken as part of this research project, two approaches to streamlining the original lengthy indexing procedure were devised.[6] In the first approach the original hierarchy of 29 index terms was compressed into a rational condensation consisting of 15 terms. The rationale for this condensation grew out of extensive indexing experience and is based on management theory. The compression was achieved by combining those terms in the original hierarchy that logically belong together in management practice[7] or that tended to be confused with each other in the actual indexing of the pilot study, cross validation, and generalization data bases. This approach, called the *rational condensation*, includes all of the information contained in the original set of 29 index terms, but extracts this information in a more efficient, less confusing, and simpler fashion.

The second approach to streamlining the complex indexing methodology, called *statistically selected subset*, capitalized on the findings resulting from the various stepwise discriminant analyses that were performed originally on the pilot study, cross validation, and generalization samples. Plots of the classification accuracy achieved over the history of the discriminant analysis procedure revealed that the most useful information in discriminating between superior chief petty officers and their slightly less qualified colleagues is contained in the variables selected initially. Therefore, a subset of approximately one-third of the initial set of 67 quantitative variables derived from the original indexing form was determined, based on the order in which these variables were selected into the discriminant functions for the four occupational specialties represented in the pilot study, cross validation, and generalization data bases, i.e., AT's, BT's, CS's, and RM's.

In this earlier study,[6] these two short-cut indexing procedures were used to index the narrative performance evaluations of 668 Navy enlisted men in Pay Grade E7. The two methods proved to be comparable in classifying each individual into correct criterion group for the four occupational specialties. Neither method demonstrated an advantage over the other in ease of implementation. Therefore, since the rational condensation short-cut indexing method examines *all* of the information contained in a narrative performance evaluation in contrast to the statistically selected subset method which takes into consideration only portions of the narrative text, thus subjecting it to indexing oversights, the rational condensation method was chosen as the superior short-cut indexing procedure.

The obvious next step in this research was to cross validate the short-cut indexing technique that proved to be superior in classifying the three E7 data bases on other occupational ratings and on other pay grades. A set of usable fleet trial data were available at the Navy Personnel Research and Development Center (NPRDC) that had been generated in the process of testing a number of experimental forms for measuring on-job performance for Pay Grades E5 and E6.[3] Figure 2 shows an example of one of these forms. The experimental forms differ in the number of scale points used and the types of scale descriptors employed. However, their Evaluation and Justification Sections



FIRST and SECOND CLASS PETTY OFFICER EVALUATION REPORT — WORKSHEET

NPTRL,SD EX 5.6-1a

1. DESCRIPTION OF DUTIES AND ACTIVITIES DURING THIS REPORTING PERIOD (INCLUDE DEPLOYMENTS AND EDUCATIONAL ACHIEVEMENTS)

INITIATING OFFICIAL
REVIEWING OFFICIAL
REVIEWING OFFICIAL
REPORTING OFFICIAL

EVALUATION SECTION

TYPICAL PETTY OFFICER OF RATEE'S RATE WHO MEETS OR EXCEEDS REQUIREMENTS OF THE JOB

COMPARE RATEE WITH ALL OTHERS OF HIS RATE KNOWN TO YOU.

* ANY MARK IN TOP BOTTOM TWO COLUMNS REQUIRES INDIVIDUAL JUSTIFICATION IN BLOCK 26

	NOT OBSERVED	EFFECTIVE: EXTREMELY EFFECTIVE AND EXCELS OVER: VIRTUALLY ALL OTHERS OF SAME RATE	NEARLY ALL	MOST	EXTREMELY	HIGHLY	ADEQUATELY	MARGINALLY	UNSATISFACTORY: MINOR SHORTCOMINGS	SERIOUS SHORTCOMINGS
2. INDIVIDUAL PRODUCTIVITY										
3. DIRECTING										
4. COUNSELING										
5. COOPERATION										
6. FLEXIBILITY										
7. RELIABILITY										
8. OVERALL EVALUATION										

		IMPRESSIVE: EXTREMELY	VERY	ADEQUATELY	MARGINALLY	UNSATISFACTORY: MINOR SHORTCOMINGS	SERIOUS SHORTCOMINGS
9. PERSONAL APPEARANCE	☐						

		IMPECCABLE	PROPER	MARGINAL	UNSATISFACTORY: MINOR VIOLATIONS	SERIOUS VIOLATIONS
10. CONDUCT	☐					

(HATCHED AREAS NEED NOT BE FILLED IN ON WORKSHEET)

IDENTIFYING INFORMATION

SPECIAL CODES 11 12 13 14

18 INNOVATIVE CONTRIBUTIONS? CHECK HERE IF YES ☐ (DESCRIBE IN BLOCK 25 OR 26)

17a. COMMAND TITLE — 17b. UIC

19 RATE — 19a. PAY GRADE — 20 OCCASION FOR THIS REPORT ☐ SEMI ANNUAL ☐ TRANSFER ☐ OTHER — 21 PERIOD OF REPORT FROM DA MO YR TO DA MO YR

22 NAME (LAST, FIRST, MIDDLE NAME OR INITIAL) — 23. SERVICE NUMBER — 24. SSN

Figure 2. Example of an Experimental First and Second Class Petty Officer Evaluation Report Form (a 75 percent photo reduction of the original form).

25. EVALUATION COMMENTS: (Include verbal expression and services to shipmates. Describe what ratee accomplished (or failed to accomplish) or what resulted from ratee's performance.)

CLARIFICATION OF TERMS

Ratee: The person being evaluated. Rate: Rating and pay grade. Innovative Contributions:(Blk 15): Improvement in procedures or mechanisms created or developed by ratee.

EVALUATION ITEMS

2. Individual Productivity: Ratee's demonstrated technical competence and own work output, including individual contribution to group effort, but not including the work of persons ratee supervises.
3. Directing: Influencing others to accomplish a job.
4. Counseling: Assisting and encouraging subordinates in self-development and to a favorable disposition toward the Naval Service.
5. Cooperation: Promoting harmonious working relationships and team effort.
6. Flexibility: Accomplishing work under changes in personnel, job content, objectives, or working conditions.
7. Reliability: Carrying out tasks without direct supervision or monitoring.
8. Overall Evaluation: General value to the Naval Service.
9. Personal Appearance: Dress and grooming, on and off duty, which reflects on the Naval Service.
10. Conduct: Behavior, on and off duty, which reflects on the Naval Service.

EXCERPTS FROM SECTION 3410150, BUPERS MANUAL

"It is desired that the member's division officer or appropriate chief petty officer make the initial evaluation. The evaluation shall be based on the specific period of time involved and reviewed for approval through the chain of command." (para. (3))

"The completed Form shall be signed by the commanding officer, except that the commanding officer may authorize the executive officer or department head to sign provided such officers are of the grade of LCDR or above, or equivalent grade officer of another service." (para. (9)(b))

"Evaluations must be based objectively on the member's demonstrated performance and his abilities as compared to established Navy standards and the performance of his contemporaries. . . . . It is necessary that a member's shortcomings, such as alcoholism or other unreliability producing deficiencies, be reported. Such deficiencies can be of vital importance in the selection of members for duty assignment, advancement, etc." (para. (4))

"Where memorandum entries of a meritorious or derogatory nature have been made in the service record e.g., on pages 6, 9 or 13, the evaluation should be corrected by an amount considered appropriate in those traits which pertain to the entry." (para. (10))

Block 25 shall contain a definite statement as to the member's abilities in self-expression, orally and in writing, and command of the English language. (para. (2))

26. JUSTIFICATION COMMENTS: (Use only to document any marks in the TOP/BOTTOM two columns of the Evaluation Section, blocks 2 thru 10. Avoid the use of adjectives which would simply be parroting the evaluation marks.)

Figure 2. (Cont.) Example of an Experimental First and Second Class Petty Officer Evaluation Report Form (a 75 percent photo reduction of the original form).

are virtually the same as these two sections in NAVPERS 1616/8 (see Figure 1). This extensive data base of fleet trial data, which included useful criterion data as well, consisted of evaluations on enlisted personnel in seven occupational specialties, only one of which (Radioman) overlapped the four ratings already studied. The fleet trial data base afforded an immediate opportunity to cross validate the rational condensation short-cut indexing procedure.

The First E5-E6 Fleet Trial Sample

A method for selecting a representative sample of these seven occupational specialties from the E5 and E6 fleet trial data base, divided equally among three criterion groups based on on-job performance (viz., Upper, Middle, Lower), was devised in collaboration with NPRDC. An initial 300-case sample of Evaluation Reports representing all seven occupational specialties was selected using this sampling methodology. This initial sample is referred to as the first E5-E6 fleet trial sample or Fleet Trial Sample 1 in order to distinguish it from a second similar sample currently being studied (see Section 6). Only nine Hospital Corpsman cases were drawn into this first sample because of their sparse representation in the overall fleet trial data base. Therefore, although these nine Evaluation Reports were indexed using the rational condensation short-cut method, they were set aside for later analysis as part of the second E5-E6 fleet trial sample and replaced by nine Damage Controlman cases in order to augment this rather small occupational group. Table 1 portrays the composition of the first 300-case E5-E6 fleet trial sample used in the investigation being reported here.

TABLE 1

COMPOSITION OF THE FIRST 300-CASE E5-E6 FLEET TRIAL SAMPLE

Occupational Specialty	N in E5	N in E6	Sum
AD - Aviation Machinists Mate	18	27	45
DC - Damage Controlman	15	15	30
ET - Electronics Technician	48	21	69
PN - Personnelman	27	39	66
RM - Radioman	18	33	51
SK - Storekeeper	15	24	39
TOTAL N	141	159	300

Derivation of the Quantitative Variables Used in the Stepwise Discriminant Analysis

A set of 23 quantitative variables was derived from the rational condensation short-cut indexing form used in the content analysis of the E5-E6 fleet trial narrative performance evaluations (see Table 2). The first 15 variables represent the weighted frequency of each index term used to index a particular section of narrative text. Variable 16 is the sum of the 15 weighted frequencies. Variables 17 through 21 represent the frequency counts over the entire rational condensation indexing form for the assignment of weights applied to modifying adjectives and adverbs used by an evaluator in a particular section of narrative text. Variable 22 is the total number of index terms of the 15 available that were used to index a particular section of narrative text. Variable 23 is the total number of words in the section of narrative text that was indexed. The reader is referred to Appendix A and to an earlier technical report[6] for a more detailed description of the rational condensation short-cut indexing procedure and the derivation and quantification of variables used in performing the stepwise discriminant analysis.

Profiles or vectors of these 23 variables were constructed for all of the Evaluation Reports contained in the first 300-case fleet trial sample based on the indexing decisions resulting from the content analysis of the narrative comments. Separate profiles were compiled for the Evaluation Section and the Justification Section of each Evaluation Report. All profiles were entered onto IBM coding forms and keypunched. The indexer did not know to which criterion group an Evaluation Report belonged while she was making her indexing decisions. This information was added to the IBM coding forms just before they were keypunched.

The first fleet trial sample then was analyzed by Program BMD07M in the library of Biomedical Computer Programs[8] at the UCLA Health Sciences Computing Facility. This program performs a multiple discriminant analysis in a stepwise manner. At each step one variable is entered into the set of discriminating variables or a variable is deleted if its F value becomes too low. At the option of the user, a classification matrix is computed and printed after those steps specified by the user.

Results

Figures 3 through 14 depict the accuracy of classifying the six occupational specialties represented in Fleet Trial Sample 1 into correct criterion group based on on-job performance as reflected in the narrative comments written in the Evaluation Section and the Justification Section. In all of these figures it can be seen that at the initial step a substantial portion of the classification problem is solved. Each curve portrayed in these 12 figures continues to climb slowly but asymptotically after the initial step; however, perfect classification performance is never reached.

The best classification that was achieved on the Evaluation Section narrative comments and the Justification Section narrative comments for the six occupational specialties represented in Fleet Trial Sample 1 is shown in

TABLE 2

DEFINITION OF THE 23 QUANTITATIVE VARIABLES DERIVED FROM THE RATIONAL CONDENSATION INDEXING FORM

Number of Variable	Description of Variable
1	Weighted Frequency of Mention of MANAGEMENT FUNCTIONS
2	Weighted Frequency of Mention of LEADERSHIP AND DIRECTING
3	Weighted Frequency of Mention of ORGANIZATION AND STAFFING
4	Weighted Frequency of Mention of PLANNING-CONTROLLING
5	Weighted Frequency of Mention of REPRESENTATION
6	Weighted Frequency of Mention of SKILLS AND ABILITIES
7	Weighted Frequency of Mention of COMMUNICATION
8	Weighted Frequency of Mention of CONDUCT AND ATTITUDE
9	Weighted Frequency of Mention of COOPERATION AND RESPONSIVENESS
10	Weighted Frequency of Mention of ENDURANCE AND MOTIVATION
11	Weighted Frequency of Mention of CREATIVITY AND INITIATIVE
12	Weighted Frequency of Mention of INTELLECTUAL FUNCTIONING
13	Weighted Frequency of Mention of PROFESSIONAL AND TECHNICAL SKILLS
14	Weighted Frequency of Mention of PRODUCTIVITY AND ACHIEVEMENT
15	Weighted Frequency of Mention of RECOGNITION
16	Sum of Variables 1 through 15
17	Total Number of +3 Weights
18	Total Number of +2 Weights
19	Total Number of +1 Weights
20	Total Number of -1 Weights
21	Total Number of -2 Weights
22	Total Number of Index Terms Used
23	Total Number of Words in Narrative Text

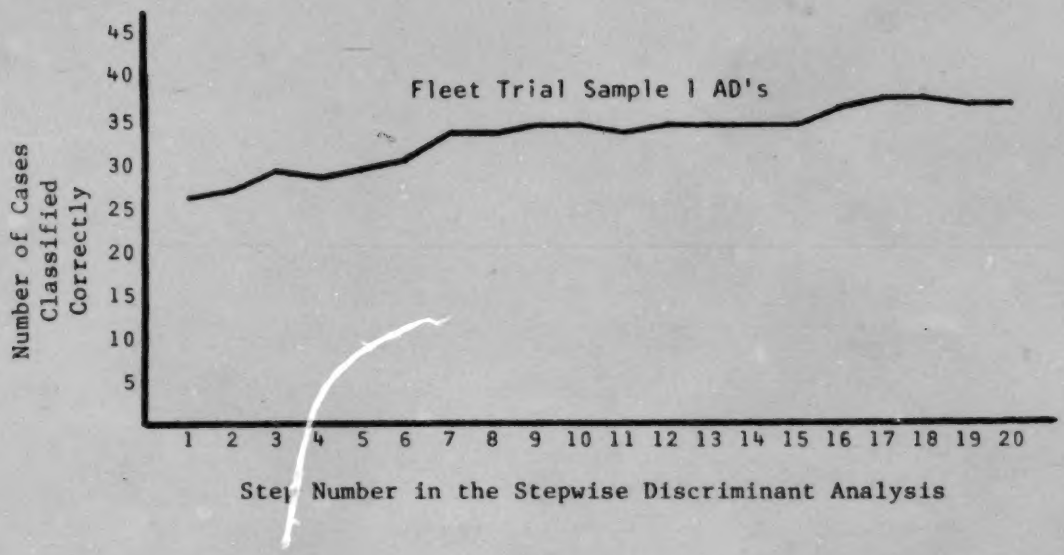


Figure 3. Accuracy of Classifying the Fleet Trial Sample 1 AD's (N=45) into Correct Criterion Group (Evaluation Section - 19R).

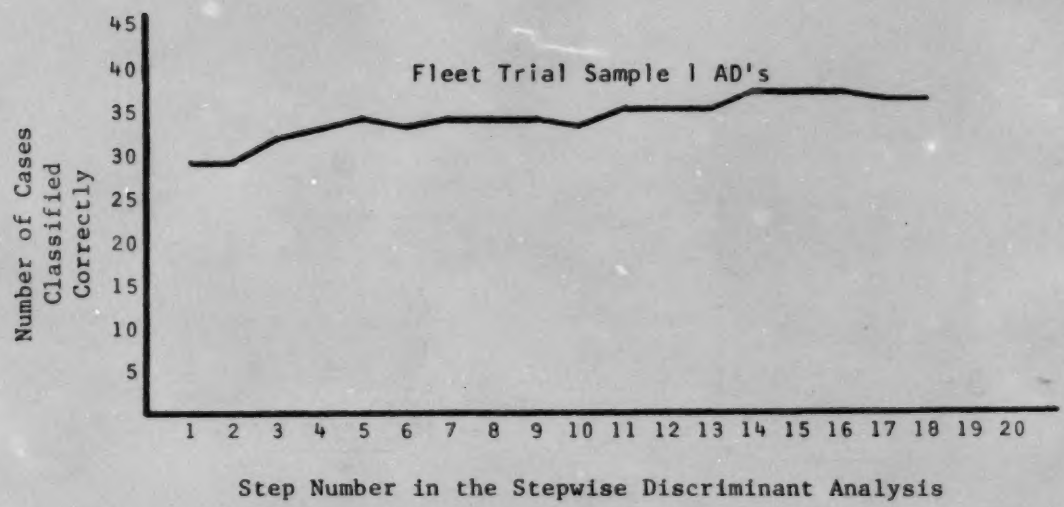


Figure 4. Accuracy of Classifying the Fleet Trial Sample 1 AD's (N=45) into Correct Criterion Group (Justification Section - 19S).

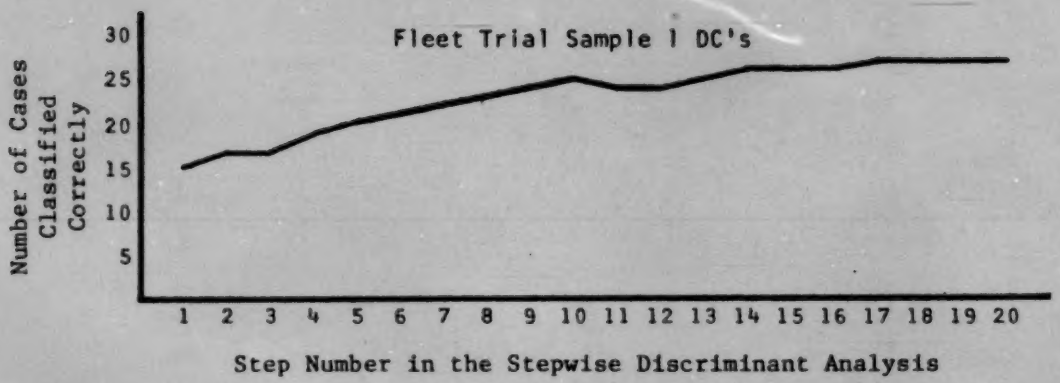

Fleet Trial Sample 1 DC's
Number of Cases Classified Correctly
30
25
20
15
10
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Step Number in the Stepwise Discriminant Analysis

Figure 5. Accuracy of Classifying the Fleet Trial Sample 1 DC's (N=30) into Correct Criterion Group (Evaluation Section - 19R).

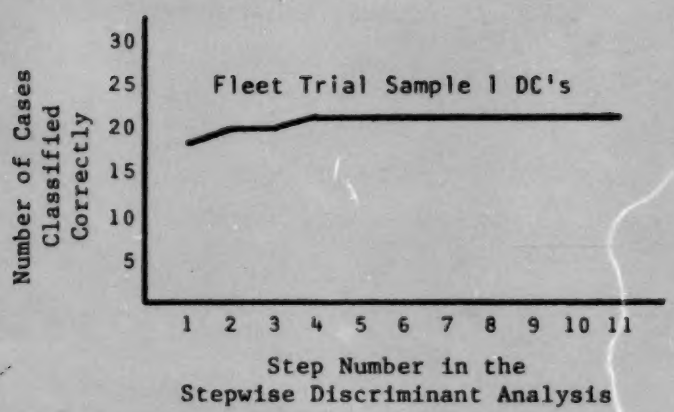


Figure 6. Accuracy of Classifying the Fleet Trial Sample 1 DC's (N=30) into Correct Criterion Group (Justification Section - 19S).

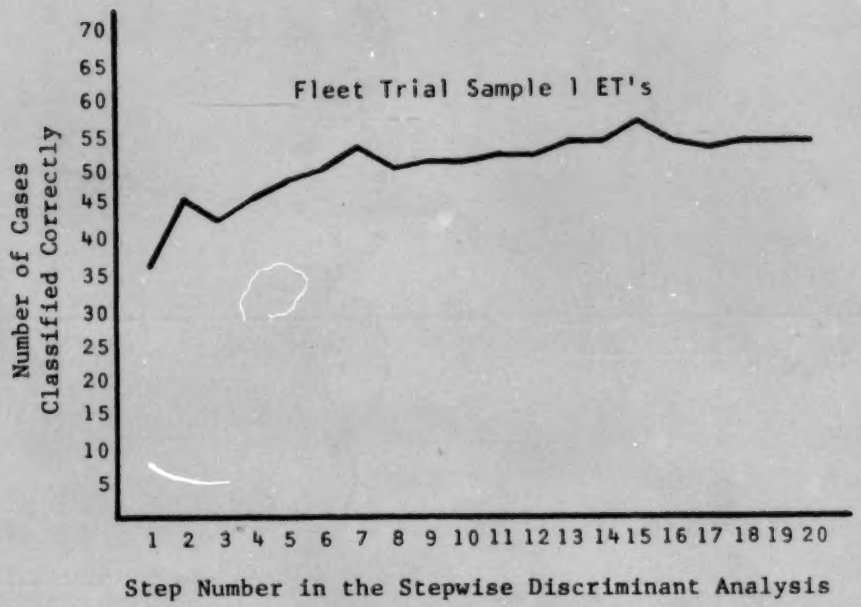


Figure 7. Accuracy of Classifying the Fleet Trial Sample 1 ET's (N=69) into Correct Criterion Group (Evaluation Section - 19R).

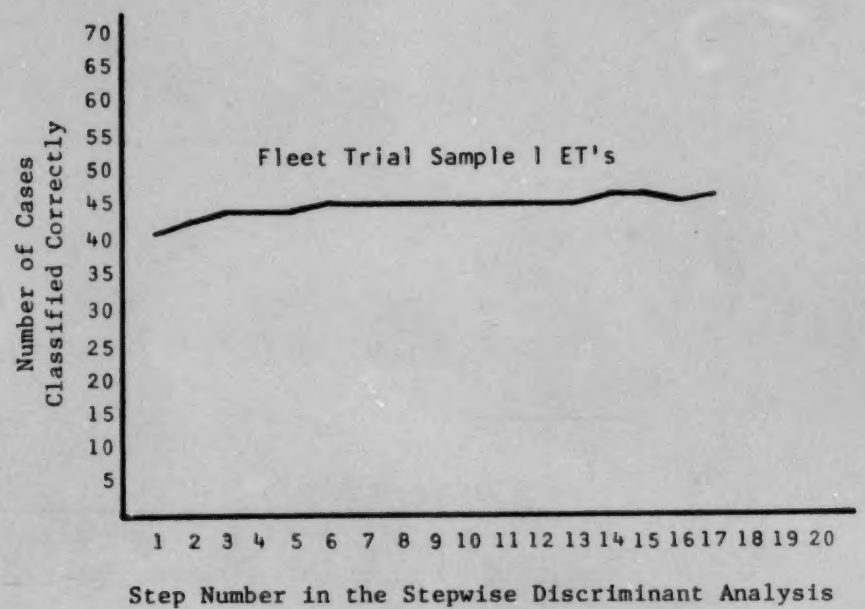


Figure 8. Accuracy of Classifying the Fleet Trial Sample 1 ET's (N=69) into Correct Criterion Group (Justification Section - 19S).

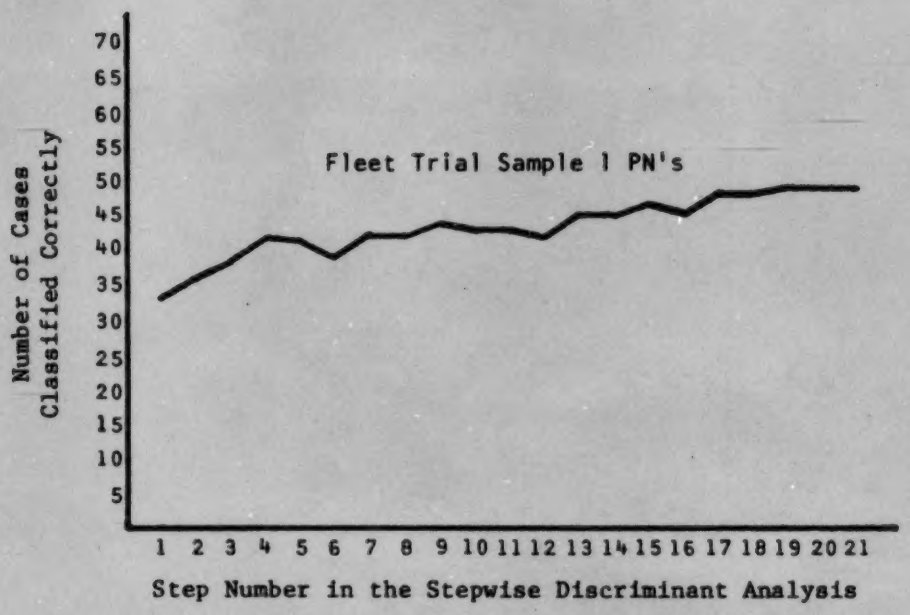


Figure 9. Accuracy of Classifying the Fleet Trial Sample 1 PN's (N=66) into Correct Criterion Group (Evaluation Section - 19R).

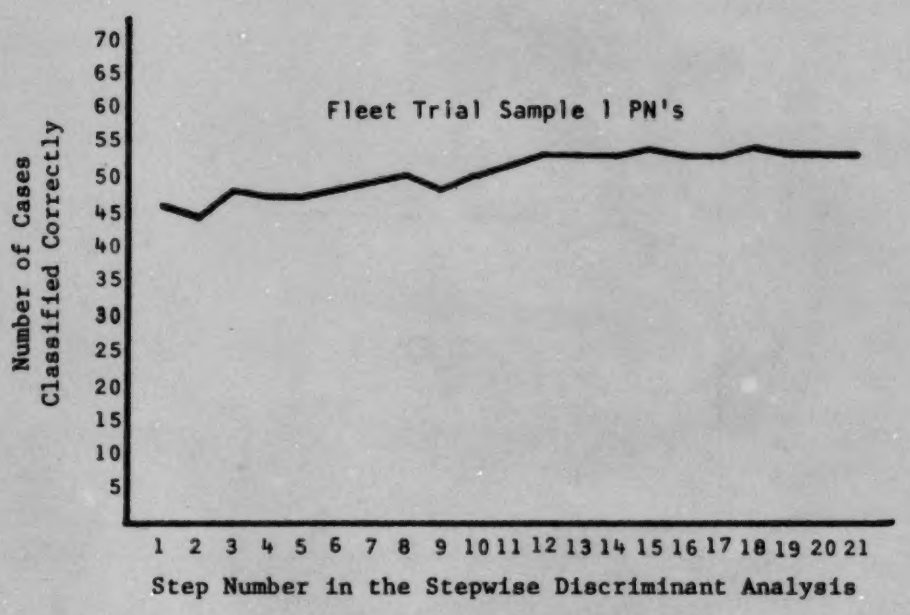


Figure 10. Accuracy of Classifying the Fleet Trial Sample 1 PN's (N=66) into Correct Criterion Group (Justification Section - 19S).

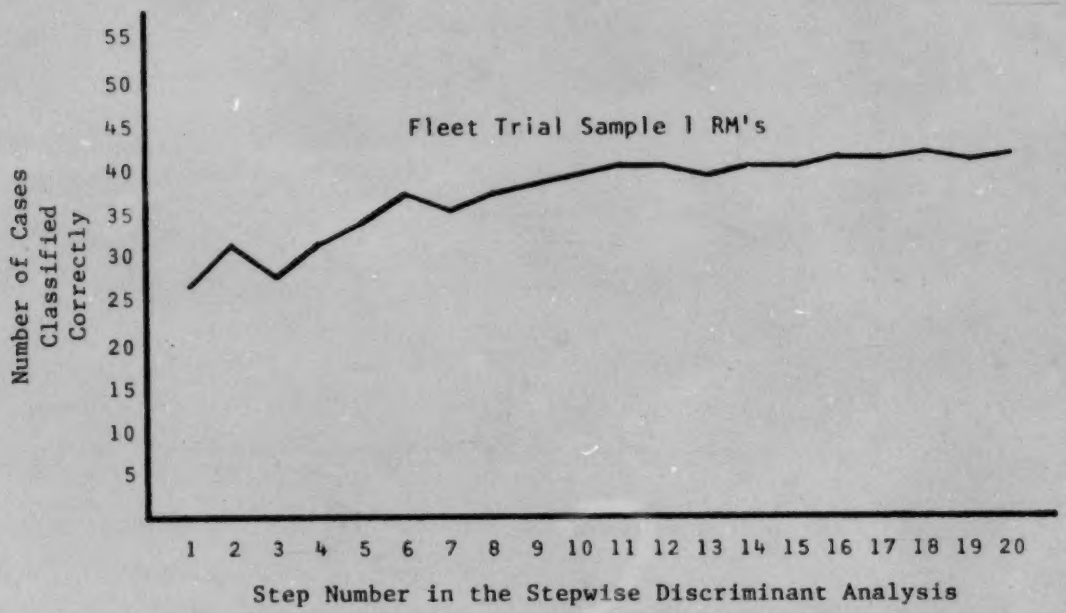


Figure 11. Accuracy of Classifying the Fleet Trial Sample 1 RM's (N=51) into Correct Criterion Group (Evaluation Section - 19R).

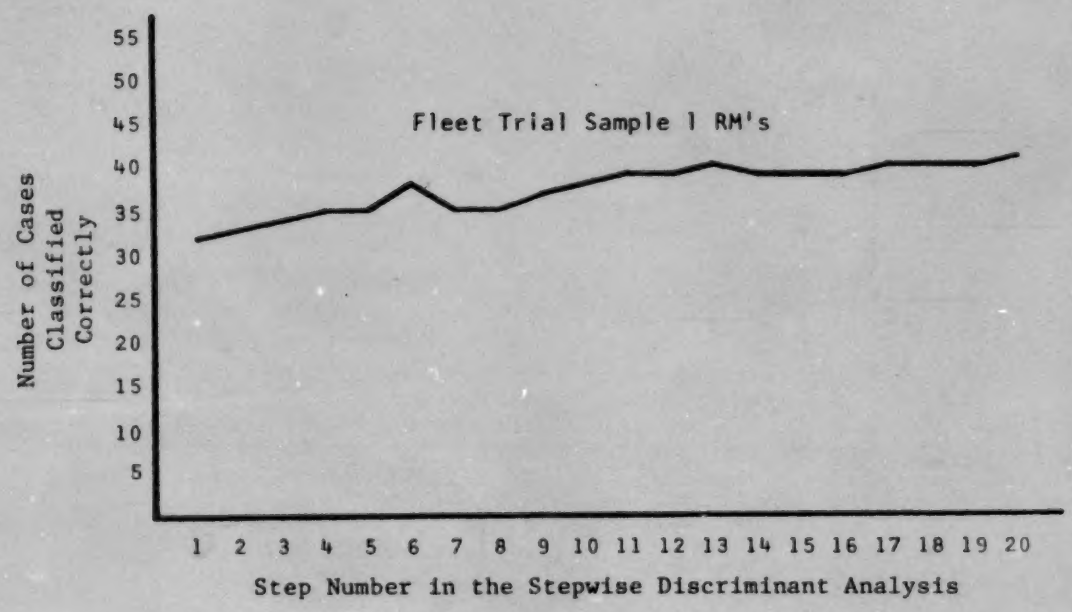


Figure 12. Accuracy of Classifying the Fleet Trial Sample 1 RM's (N=51) into Correct Criterion Group (Justification Section - 19S).

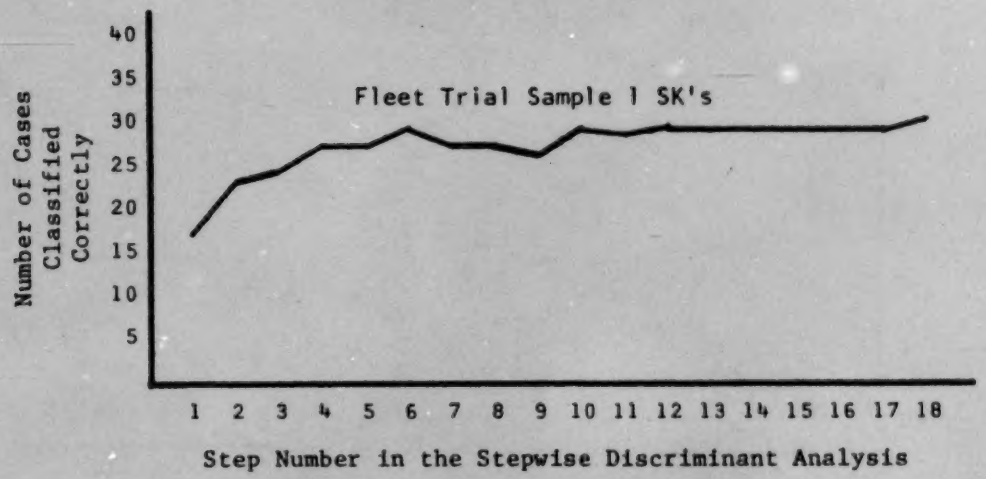


Figure 13. Accuracy of Classifying the Fleet Trial Sample 1 SK's (N=39) into Correct Criterion Group (Evaluation Section - 19R).

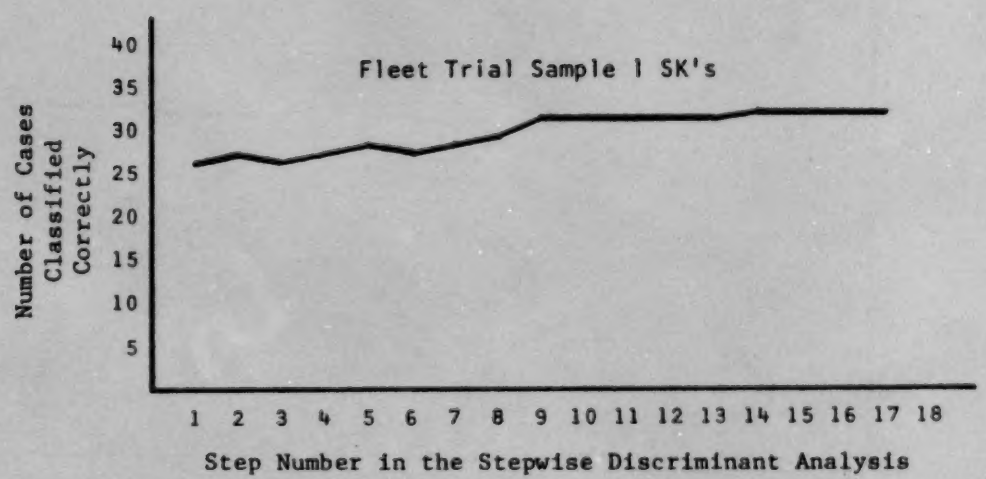


Figure 14. Accuracy of Classifying the Fleet Trial Sample 1 SK's (N=39) into Correct Criterion Group (Justification Section - 19S).

Tables 3 through 8. The underlined diagonal elements of the classification matrices portrayed in these six tables correspond to the agreement between the statistical classification into criterion group and actual criterion group membership; the off-diagonal elements represent disagreement. The total number of statistical classifications matching actual classifications is obtained by summing the diagonal elements of each matrix, shown in these six tables as the underlined diagonal sum. The step in the discriminant analysis at which this best classification was achieved for the Evaluation Section and the Justification Section also is shown in these tables and corresponds to the maximum point in the curves shown for each occupational specialty in Figures 3 through 14. It should be pointed out that this presentation of the discriminant analysis results assumes that the criterion of actual group membership is perfect where in fact the possibility does exist that some of the members of the sample were given inflated marks on on-job performance, and consequently, were assigned to an incorrect criterion group.

A recapitulation of the classification accuracy achieved for the six occupational specialties represented in the first fleet trial sample using the rational condensation short-cut indexing procedure is provided in Table 9. Classification accuracy ranged from 67 percent to 90 percent. In earlier content analysis studies[5,6] at the E7 pay grade level, it was found that better classification performance was achieved in the stepwise discriminant analysis of the Justification Section narrative comments compared to the Evaluation Section narrative comments. This finding was not corroborated at the E5-E6 pay grade levels. In only two E5-E6 occupational specialties---PN and SK---was the classification performance better for the Justification Section. For the E5-E6 DC's, ET's, and RM's better classification performance was achieved in the stepwise discriminant analysis of the Evaluation Section, and for the E5-E6 AD's the classification accuracy was the same for both sections of narrative comments.

The classification accuracy achieved in the stepwise discriminant analysis of the first 300-case E5-E6 fleet trial sample is less than that achieved in earlier content analysis studies of the narrative performance evaluations for four occupational specialties in Pay Grade E7.[5,6] Several reasons may help explain these results. First, in the lower pay grades the job duties performed by enlisted personnel are less demanding, more routine, and not so managerial in nature as the job duties performed by chief petty officers in Pay Grade E7. Consequently, there may be less critical observational data available upon which to base a performance evaluation, reflecting itself in narrative comments that may lack the necessary substance to differentiate between good and superlative first and second class petty officers. The indexer's subjective impression was that the narrative text of performance evaluations typically is shorter for the lower pay grades, and Table 10 substantiates this impression for the Justification Section. The total number of words in the narrative text of the Evaluation Section on the average is quite similar for the three pay grades on the Upper and Middle criterion groups. Only on the Lower criterion group is there a noticeable gradient for the Evaluation Section from fewer to more words on the average as pay grade increases, and even then the average number of words for the pilot study E7's is almost identical to that of the fleet trial E6's. However, on the Justification Section the gradient is very clear-cut for all three criterion

TABLE 3

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 AD's (N=45) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 17 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	11	2	2
MIDDLE	0	14	1
LOWER	2	1	12

Diagonal Sum = 37

(37 ÷ 45 × 100 = 82%)

JUSTIFICATION SECTION - 19S

Step 14 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	13	0	2
MIDDLE	1	10	4
LOWER	0	1	14

Diagonal Sum = 37

(37 ÷ 45 × 100 = 82%)

TABLE 4

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 DC's (N=30) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 17 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	9	1	0
MIDDLE	0	9	1
LOWER	1	0	9

Diagonal Sum = 27

(27 ÷ 30 × 100 = 90%)

JUSTIFICATION SECTION - 19S

Step 4 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	9	0	1
MIDDLE	0	2	8
LOWER	0	0	10

Diagonal Sum = 21

(21 ÷ 30 × 100 = 70%)

TABLE 5

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 ET's (N=69) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 15

Actual Criterion Group Membership	Classification by Discriminant Analysis: UPPER	MIDDLE	LOWER
UPPER	19	4	0
MIDDLE	3	18	2
LOWER	2	1	20

Diagonal Sum = 57

(57 ÷ 69 × 100 = 83%)

JUSTIFICATION SECTION - 19S

Step 14

Actual Criterion Group Membership	Classification by Discriminant Analysis: UPPER	MIDDLE	LOWER
UPPER	19	0	4
MIDDLE	1	4	18
LOWER	0	0	23

Diagonal Sum = 46

(46 ÷ 69 × 100 = 67%)

TABLE 6

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 PN's (N=66) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 19

Actual Criterion Group Membership	Classification by Discriminant Analysis: UPPER	MIDDLE	LOWER
UPPER	18	4	0
MIDDLE	3	16	3
LOWER	1	6	15

Diagonal Sum = 49

(49 ÷ 66 × 100 = 74%)

JUSTIFICATION SECTION - 19S

Step 15

Actual Criterion Group Membership	Classification by Discriminant Analysis: UPPER	MIDDLE	LOWER
UPPER	20	1	1
MIDDLE	0	14	8
LOWER	0	2	20

Diagonal Sum = 54

(54 ÷ 66 × 100 = 82%)

TABLE 7

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 RM's (N=51) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 18 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	15	1	1
MIDDLE	4	11	2
LOWER	0	1	16

Diagonal Sum = 42

(42 ÷ 51 × 100 = 82%)

JUSTIFICATION SECTION - 19S

Step 20 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	17	0	0
MIDDLE	0	8	9
LOWER	0	1	16

Diagonal Sum = 41

(41 ÷ 51 × 100 = 80%)

TABLE 8

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 SK'ε (N=39) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 18 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	10	1	2
MIDDLE	1	9	3
LOWER	2	0	11

Diagonal Sum = 30

(30 ÷ 39 × 100 = 77%)

JUSTIFICATION SECTION - 19S

Step 14 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	13	0	0
MIDDLE	0	6	7
LOWER	0	0	13

Diagonal Sum = 32

(32 ÷ 39 × 100 = 82%)

TABLE 9

RECAPITULATION OF THE CLASSIFICATION ACCURACY ACHIEVED FOR THE SIX OCCUPATIONAL SPECIALTIES REPRESENTED IN THE FIRST FLEET TRIAL SAMPLE USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Sample/Occupational Specialty	Sample Size	Classification Accuracy
FLEET TRIAL SAMPLE 1 AD's	45	
Evaluation Section		37 out of 45 (82%)
Justification Section		37 out of 45 (82%)
FLEET TRIAL SAMPLE 1 DC's	30	
Evaluation Section		27 out of 30 (90%)
Justification Section		21 out of 30 (70%)
FLEET TRIAL SAMPLE 1 ET's	69	
Evaluation Section		57 out of 69 (83%)
Justification Section		46 out of 69 (67%)
FLEET TRIAL SAMPLE 1 PN's	66	
Evaluation Section		49 out of 66 (74%)
Justification Section		54 out of 66 (82%)
FLEET TRIAL SAMPLE 1 RM's	51	
Evaluation Section		42 out of 51 (82%)
Justification Section		41 out of 51 (80%)
FLEET TRIAL SAMPLE 1 SK's	39	
Evaluation Section		30 out of 39 (77%)
Justification Section		32 out of 39 (82%)

TABLE 10

ARITHMETIC MEAN OF THE VARIABLE *TOTAL NUMBER OF WORDS IN NARRATIVE TEXT* FOR EACH OF THE THREE CRITERION GROUPS IN BOTH THE EVALUATION AND THE JUSTIFICATION SECTIONS ACROSS ALL SAMPLES STUDIED

	Fleet Trial E5's (N=141)	Fleet Trial E6's (N=159)	Pilot Study E7's (N=224)	Cross Validation E7's (N=222)	Generalization E7's (N=222)
Evaluation Section					
Upper	86.4041	88.2828	88.8398	78.3376	98.1754
Middle	75.2339	76.1319	75.8531	86.5808	84.5132
Lower	65.4679	66.9810	66.7730	87.1889	100.2835
Justification Section					
Upper	92.5956	109.5281	173.8397	201.4052	228.2968
Middle	17.4041	42.2262	112.1464	146.5944	133.0268
Lower	1.6596	3.9623	10.7466	17.6754	27.4051

groups, with the narrative text of justification comments for the lower two pay grades being considerably shorter on the average. If fewer words also indicate less substantive content, then there is less potentially differentiating information in the narrative comments written by evaluators for enlisted personnel in Pay Grades E5 and E6.

Another possible explanation to help account for the poorer classification accuracy achieved in the stepwise discriminant analysis of the first E5-E6 fleet trial sample compared to that achieved in earlier content analysis studies at the E7 pay grade level is that the sample sizes in the six occupational specialties represented in the first E5-E6 fleet trial sample are quite small in comparison to the sample sizes studied earlier for the four E7 occupational specialties. Enlarging the sample sizes for the first E5-E6 fleet trial sample occupational specialties might result in classification performance of higher accuracy. A third possibility is that the six occupational specialties represented in the first E5-E6 fleet trial sample constitute job categories that afford less differentiating performance data than the four occupational specialties represented in the E7 samples studied earlier.

There was only one occupational specialty in common in the E5-E6 and E7 samples---Radioman (RM). The classification results on the Evaluation Section were comparable in the two samples. For the Evaluation Section, 42 of the 51 E5-E6 RM's were classified correctly (82%) compared to 131 of the 162 E7 RM's (81%). However, for the Justification Section, 41 of the 51 E5-E6 RM's were classified correctly (80%) compared to 144 of the 162 E7 RM's (89%). The better classification accuracy on the Justification Section achieved for the E7 RM's compared to the E5-E6 RM's most likely is a reflection of the lengthier narrative text in justification comments written about enlisted personnel at the higher pay grade level.

In earlier research,[5] it was shown that better classification is achieved if each occupational specialty is analyzed separately rather than if all of the occupational specialties represented in a sample are combined for the stepwise discriminant analysis. This earlier finding was corroborated in the analysis of the first E5-E6 fleet trial sample. The six occupational specialties represented in the sample were combined to form two subsamples, one consisting of 141 E5's and the other consisting of 159 E6's. Figures 15 and 16 depict the accuracy of classifying the Fleet Trial Sample 1 E5's into correct criterion group for the Evaluation Section and for the Justification Section. Again, a substantial portion of the classification problem is solved at the first step. In Figure 16, however, the final classification performance is essentially the same as that demonstrated at the initial step. The best classification accuracy that was achieved on the Evaluation Section and the Justification Section of the Fleet Trial Sample 1 E5's is shown in Table 11. Of the 141 E5's represented in the first E5-E6 fleet trial sample, 91 (65%) were classified correctly on the Evaluation Section, this maximum classification accuracy occurring at Step 8. On the Justification Section, at Step 10 a maximum of 95 (67%) of the 141 E5's were classified correctly. In most instances, this classification performance is inferior to that achieved when the six occupational specialties were analyzed separately.

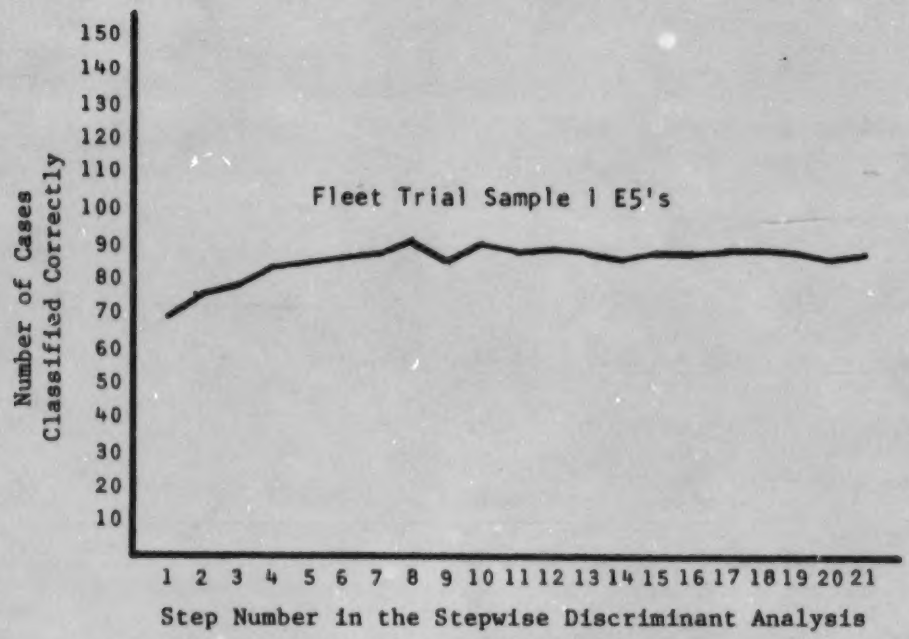


Figure 15. Accuracy of Classifying the Fleet Trial Sample 1 E5's (N=141) into Correct Criterion Group (Evaluation Section - 19R).

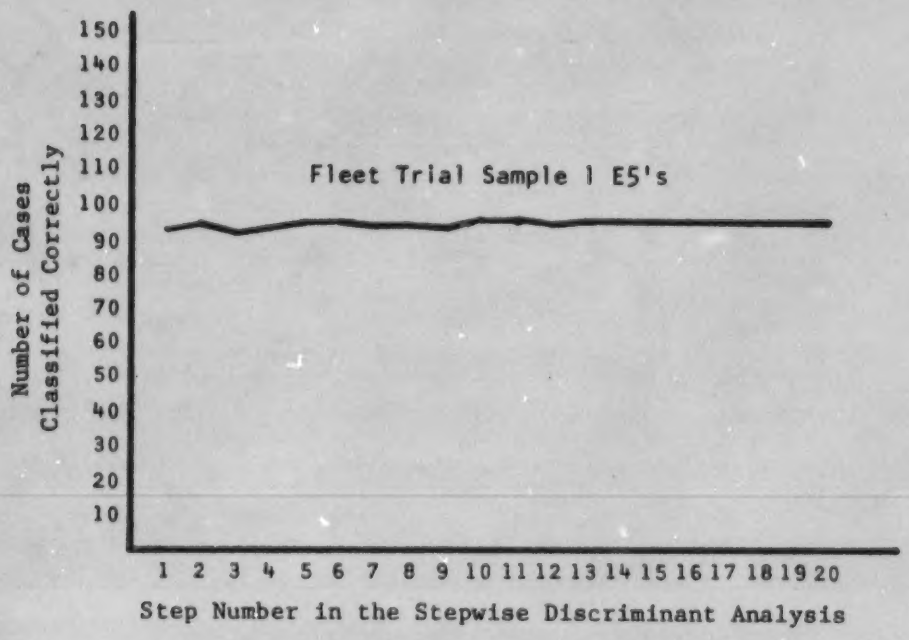


Figure 16. Accuracy of Classifying the Fleet Trial Sample 1 E5's (N=141) into Correct Criterion Group (Justification Section - 19S).

TABLE 11

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 E5's (N=141) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 8 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	28	16	3
MIDDLE	12	31	4
LOWER	7	8	32

Diagonal Sum = 91

(91 ÷ 141 × 100 = 65%)

JUSTIFICATION SECTION - 19S

Step 10 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	38	6	3
MIDDLE	3	10	34
LOWER	0	0	47

Diagonal Sum = 95

(95 ÷ 141 × 100 = 67%)

TABLE 12

BEST CLASSIFICATION INTO THE THREE CRITERION GROUPS FOR THE FLEET TRIAL SAMPLE 1 E6's (N=159) USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

EVALUATION SECTION - 19R

Step 5 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	36	12	5
MIDDLE	12	32	9
LOWER	9	15	29

Diagonal Sum = 97

(97 ÷ 159 × 100 = 61%)

JUSTIFICATION SECTION - 19S

Step 20 — Classification by Discriminant Analysis

Actual Criterion Group Membership	UPPER	MIDDLE	LOWER
UPPER	43	6	4
MIDDLE	4	29	20
LOWER	0	4	49

Diagonal Sum = 121

(121 ÷ 159 × 100 = 76%)

Figures 17 and 18 depict the accuracy of classifying the Fleet Trial Sample 1 E6's into correct criterion group for the Evaluation Section and for the Justification Section. A substantial portion of the classification problem is solved at Step 1 in both of these figures; however, the classification performance shown in Figure 18 for the Justification Section is superior to that shown in Figure 17 for the Evaluation Section. The best classification accuracy that was achieved on the Evaluation Section and the Justification Section of the Fleet Trial Sample 1 E6's is shown in Table 12. Of the 159 E6's represented in the first E5-E6 fleet trial sample, 97 (61%) were classified correctly on the Evaluation Section, this maximum classification accuracy occurring at Step 5. On the Justification Section, at Step 20 a maximum of 121 (76%) of the 159 E6's were classified correctly. This classification performance for the E6 subsample is somewhat better than that achieved for the E5 subsample but still less than that achieved for most of the six occupational specialties analyzed separately.

It is of particular interest to note that most of the misclassifications made by the stepwise discriminant analysis procedure, as judged by the criterion of on-job performance, were in the direction of classifying an individual into a lower criterion group than the one to which he actually belonged. If it is acknowledged that the criterion of on-job performance may be imperfect, then what the stepwise discriminant analysis procedure appears to be doing is to sift out the individuals who might have been assigned to a higher criterion group because of inflated marks on the criterion of on-job performance. If this speculation proves to be true, then the stepwise discriminant analysis procedure results in flagging for consideration only those individuals who manifest the highest job performance potential based on the narrative comments written by their evaluators. Application of this statistical technique then would help to narrow the field of candidates for advancement, duty assignment, training, or quality retention to only those individuals potentially the most qualified.

An interesting set of results is revealed by an examination of which variables were selected by the stepwise discriminant analysis program for the first 15 steps in each of the computer runs that were made. Tables 13 through 18 show the results for the six occupational specialties represented in the first E5-E6 fleet trial sample. The results for the Evaluation Section and the Justification Section are presented separately in each of these six tables. A careful perusal of the findings presented in these tables reveals that the variables selected early tend to be different between the Evaluation Section and the Justification Section and among the six occupational specialties. These differences may be attributable to real variation among job groups with regard to the skills and abilities required to perform one's job duties well, or they may only reflect aberrations attributable to the smallness of some of the sample sizes. These findings point up the need to cross validate the results of studies based on small samples in order to determine which discriminating variables are constant over more than one sample. If the same set of variables emerge as the most discriminating ones when two or more samples are combined to produce larger sample sizes, then more confidence can be placed in the results. An extension of the investigation being reported here is discussed in Section 6.

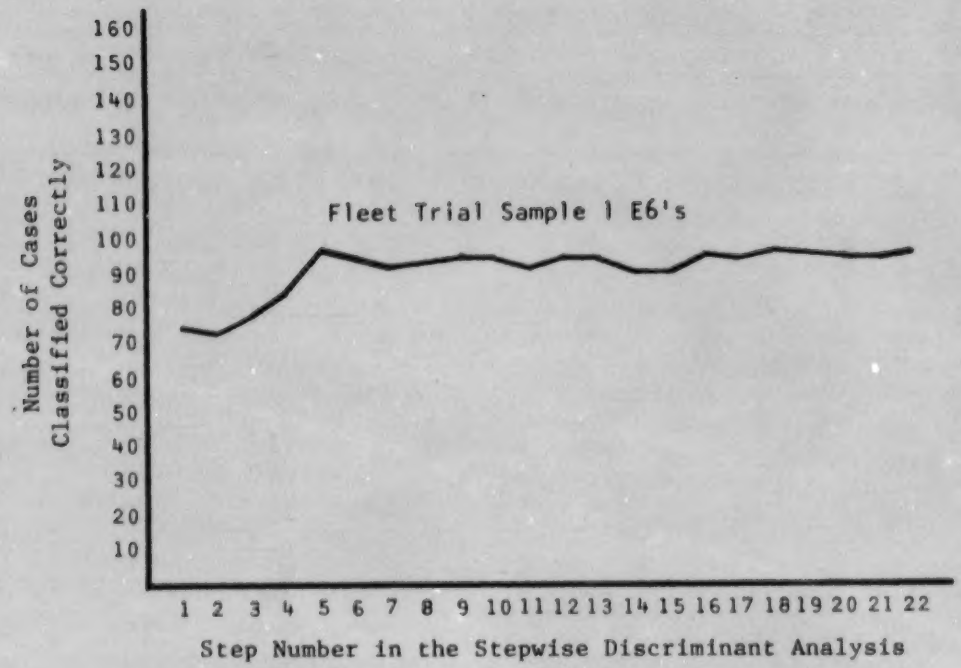


Figure 17. Accuracy of Classifying the Fleet Trial Sample 1 E6's (N=159) into Correct Criterion Group (Evaluation Section - 19R).

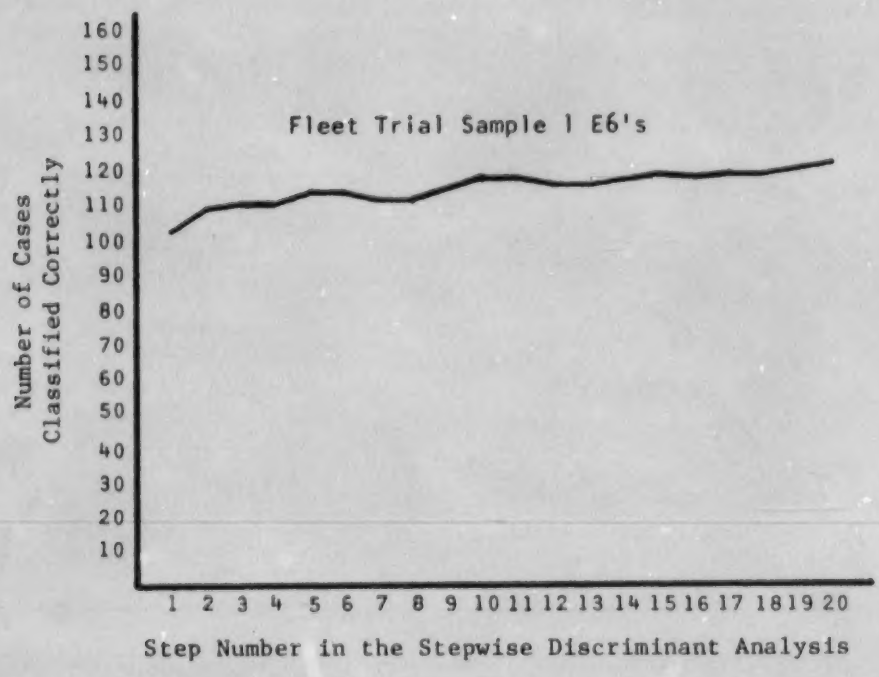


Figure 18. Accuracy of Classifying the Fleet Trial Sample 1 E6's (N=159) into Correct Criterion Group (Justification Section - 19S).

TABLE 13

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 AD's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	wf of PRODUCTIVITY AND ACHIEVEMENT	Total Number of Index Terms Used
2	Total Number of -1 Weights	wf of MANAGEMENT FUNCTIONS
3	wf of PROFESSIONAL AND TECHNICAL SKILLS	wf of RECOGNITION
4	wf of COOPERATION AND RESPONSIVENESS	wf of ENDURANCE AND MOTIVATION
5	wf of REPRESENTATION	wf of CREATIVITY AND INITIATIVE
6	wf of LEADERSHIP AND DIRECTING	Total Number of 3 Weights
7	wf of CREATIVITY AND INITIATIVE	wf of PLANNING-CONTROLLING
8	wf of PLANNING-CONTROLLING	wf of COOPERATION AND RESPONSIVENESS
9	wf of ENDURANCE AND MOTIVATION	wf of REPRESENTATION
10	Total Number of 2 Weights	wf of INTELLECTUAL FUNCTIONING
11	wf of CONDUCT AND ATTITUDE	wf of PRODUCTIVITY AND ACHIEVEMENT
12	wf of INTELLECTUAL FUNCTIONING	wf of CONDUCT AND ATTITUDE
13	wf of SKILLS AND ABILITIES	Total Number of 1 Weights
14	Total Number of Index Terms Used	wf of SKILLS AND ABILITIES
15	Total Number of 1 Weights	Total Number of Words in Text

TABLE 14

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 DC's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	Total Number of -1 Weights	Total Number of Index Terms Used
2	wf of INTELLECTUAL FUNCTIONING	wf of COOPERATION AND RESPONSIVENESS
3	wf of PLANNING-CONTROLLING	wf of LEADERSHIP AND DIRECTING
4	wf of COOPERATION AND RESPONSIVENESS	wf of PLANNING-CONTROLLING
5	wf of ORGANIZATION AND STAFF-ING	wf of ORGANIZATION AND STAFF-ING
6	wf of PRODUCTIVITY AND ACHIEVEMENT	Total Number of 1 Weights
7	wf of CONDUCT AND ATTITUDE	wf of RECOGNITION
8	wf of MANAGEMENT FUNCTIONS	wf of ENDURANCE AND MOTIVATION
9	wf of ENDURANCE AND MOTIVATION	Total Number of Words in Text
10	wf of RECOGNITION	wf of CREATIVITY AND INITIATIVE
11	Total Number of Index Terms Used	wf of COMMUNICATION (last step)
12	wf of REPRESENTATION	
13	Total Number of 1 Weights	
14	Total Number of Words in Text	
15	wf of LEADERSHIP AND DIRECTING	

TABLE 15

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 ET's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	Total Number of -1 Weights	Total Number of Words in Text
2	wf of ENDURANCE AND MOTIVATION	wf of PRODUCTIVITY AND ACHIEVEMENT
3	Sum of Variables 1 through 15	wf of RECOGNITION
4	wf of COOPERATION AND RESPONSIVENESS	Total Number of -1 Weights
5	wf of CREATIVITY AND INITIATIVE	wf of MANAGEMENT FUNCTIONS
6	wf of COMMUNICATION	Total Number of 1 Weights
7	wf of PROFESSIONAL AND TECHNICAL SKILLS	wf of INTELLECTUAL FUNCTIONING
8	wf of SKILLS AND ABILITIES	wf of COOPERATION AND RESPONSIVENESS
9	wf of CONDUCT AND ATTITUDE	Sum of Variables 1 through 15
10	wf of INTELLECTUAL FUNCTIONING	Total Number of 2 Weights
11	Total Number of -2 Weights	Total Number of Index Terms Used
12	Total Number of 2 Weights	wf of CREATIVITY AND INITIATIVE
13	wf of REPRESENTATION	wf of ENDURANCE AND MOTIVATION
14	Total Number of Words in Text	wf of CONDUCT AND ATTITUDE
15	Total Number of Index Terms Used	wf of ORGANIZATION AND STAFFING

TABLE 16

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 PN's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	Sum of Variables 1 through 15	Sum of Variables 1 through 15
2	Total Number of -1 Weights	Total Number of Index Terms Used
3	Total Number of Index Terms Used	Total Number of 2 Weights
4	wf of CONDUCT AND ATTITUDE	Total Number of -2 Weights
5	wf of ENDURANCE AND MOTIVATION	Total Number of -1 Weights
6	wf of REPRESENTATION	wf of ORGANIZATION AND STAFFING
7	wf of INTELLECTUAL FUNCTIONING	wf of MANAGEMENT FUNCTIONS
8	Total Number of Words in Text	wf of INTELLECTUAL FUNCTIONING
9	wf of RECOGNITION	wf of CREATIVITY AND INITIATIVE
10	wf of SKILLS AND ABILITIES	wf of SKILLS AND ABILITIES
11	wf of PRODUCTIVITY AND ACHIEVEMENT	wf of COOPERATION AND RESPONSIVENESS
12	wf of PLANNING-CONTROLLING	wf of COMMUNICATION
13	Total Number of 2 Weights	wf of PROFESSIONAL AND TECHNICAL SKILLS
14	wf of ORGANIZATION AND STAFFING	wf of LEADERSHIP AND DIRECTING
15	Total Number of 1 Weights	wf of RECOGNITION

TABLE 17

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 RM's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	wf of PRODUCTIVITY AND ACHIEVEMENT	Total Number of Index Terms Used
2	Sum of Variables 1 through 15	wf of REPRESENTATION
3	wf of CONDUCT AND ATTITUDE	wf of CONDUCT AND ATTITUDE
4	Total Number of Words in Text	wf of ENDURANCE AND MOTIVATION
5	Total Number of Index Terms Used	wf of PRODUCTIVITY AND ACHIEVEMENT
6	wf of SKILLS AND ABILITIES	wf of MANAGEMENT FUNCTIONS
7	wf of PLANNING-CONTROLLING	wf of ORGANIZATION AND STAFFING
8	wf of RECOGNITION	Total Number of -1 Weights
9	wf of MANAGEMENT FUNCTIONS	wf of INTELLECTUAL FUNCTIONING
10	wf of REPRESENTATION	wf of COOPERATION AND RESPONSIVENESS
11	wf of ENDURANCE AND MOTIVATION	wf of PROFESSIONAL AND TECHNICAL SKILLS
12	Total Number of 3 Weights	Total Number of Words in Text
13	wf of ORGANIZATION AND STAFFING	wf of SKILLS AND ABILITIES
14	wf of LEADERSHIP AND DIRECTING	wf of RECOGNITION
15	wf of COOPERATION AND RESPONSIVENESS	wf of COMMUNICATION

TABLE 18

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 SK's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	wf of COMMUNICATION	Total Number of Index Terms Used
2	wf of LEADERSHIP AND DIRECTING	wf of COMMUNICATION
3	wf of PRODUCTIVITY AND ACHIEVEMENT	wf of SKILLS AND ABILITIES
4	wf of MANAGEMENT FUNCTIONS	wf of PROFESSIONAL AND TECHNICAL SKILLS
5	wf of INTELLECTUAL FUNCTIONING	wf of COOPERATION AND RESPONSIVENESS
6	wf of RECOGNITION	wf of LEADERSHIP AND DIRECTING
7	Total Number of 3 Weights	Total Number of Words in Text
8	wf of COOPERATION AND RESPONSIVENESS	Sum of Variables 1 through 15
9	Total Number of 2 Weights	wf of RECOGNITION
10	wf of ENDURANCE AND MOTIVATION	wf of PRODUCTIVITY AND ACHIEVEMENT
11	wf of ORGANIZATION AND STAFFING	wf of CREATIVITY AND INITIATIVE
12	Total Number of Words in Text	Total Number of 1 Weights
13	wf of PLANNING-CONTROLLING	wf of MANAGEMENT FUNCTIONS
14	wf of PROFESSIONAL AND TECHNICAL SKILLS	wf of INTELLECTUAL FUNCTIONING
15	Total Number of Index Terms Used	wf of PLANNING-CONTROLLING

In Tables 19 and 20 the variables selected by the stepwise discriminant analysis program at Steps 1 through 15 are shown for the first fleet trial sample E5's and E6's. Again, the results for the Evaluation Section and the Justification Section are presented separately. When all six occupational specialties are considered together at each of these two pay grade levels, it is of interest to note that the same variable was selected first for the E5's and the E6's, albeit a different variable for the two sections of narrative comments. For the Evaluation Section, Total Number of -1 Weights was the first variable selected for both E5's and E6's. For the Justification Section, the first variable selected was Total Number of Index Terms Used. The first variable selected is extremely important since at least half of the classification problem tends to be solved at the first step for these two pay grades regardless of which section of narrative comments is being analyzed. Particularly noteworthy is the selection by the stepwise discriminant analysis program of the variable, Total Number of Index Terms Used, for the Justification Section. In earlier content analysis studies[5,6] at the E7 pay grade level, *without exception* the first variable selected for the Justification Section was Total Number of Index Terms Used. This variable reflects the variety of specific areas of an individual's performance that the evaluator chose to comment on, and is measured by the number of different index terms chosen by the indexer to encompass the narrative content. This finding indicates that the range of skills and abilities that a petty officer manifests is a key factor in his superior performance as narrated by the evaluator in the Justification Section.

In order to gain a better feeling for which variables may prove to be the most discriminating ones in further studies of these six E5-E6 occupational specialties based on larger sample sizes, Tables 21 and 22 were prepared. These two tables present a summary of the variables selected by the stepwise discriminant analysis program for all six occupational specialties arranged in order by frequency of choice and early selection. Table 21 depicts the results for the Evaluation Section; Table 22 shows the results for the Justification Section. The way that these two tables were constructed was first to note those variables that within the first 15 steps were selected for all six occupational specialties, then those selected for five of the six occupational specialties, and so on down to being selected within the first 15 steps for only one of the six occupational specialties. Then, within each level of frequency of choice the variables were ranked by how early they were selected, based on the sum of the steps for all six occupational specialties. For example, in Table 21 it can be seen that only two variables were selected within the first 15 steps for all six occupational specialties---weighted frequency (wf) of ENDURANCE AND MOTIVATION and Total Number of Index Terms Used. Since wf of ENDURANCE AND MOTIVATION tended to be selected earlier than Total Number of Index Terms Used (as reflected in a total sum of 46 versus 63), it was assigned a rank of one.

Although the results shown in Tables 21 and 22 are only tentative, they do allow some interesting preliminary observations to be made. First, for both sections of narrative comments all 23 quantitative variables derived from the rational condensation short-cut indexing procedure were selected within the first 15 steps by at least one occupational specialty, suggesting that all

TABLE 19

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 E5's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	Total Number of -1 Weights	Total Number of Index Terms Used
2	wf of PRODUCTIVITY AND ACHIEVEMENT	wf of COMMUNICATION
3	wf of PLANNING-CONTROLLING	wf of REPRESENTATION
4	wf of ORGANIZATION AND STAFFING	Total Number of -1 Weights
5	wf of ENDURANCE AND MOTIVATION	wf of PRODUCTIVITY AND ACHIEVEMENT
6	wf of PROFESSIONAL AND TECHNICAL SKILLS	Total Number of 2 Weights
7	wf of CREATIVITY AND INITIATIVE	wf of LEADERSHIP AND DIRECTING
8	wf of RECOGNITION	wf of CREATIVITY AND INITIATIVE
9	Total Number of 1 Weights	Total Number of 1 Weights
10	wf of REPRESENTATION	Total Number of Words in Text
11	wf of COMMUNICATION	wf of MANAGEMENT FUNCTIONS
12	wf of INTELLECTUAL FUNCTIONING	wf of RECOGNITION
13	wf of MANAGEMENT FUNCTIONS	Total Number of -2 Weights
14	Total Number of 2 Weights	wf of ORGANIZATION AND STAFFING
15.	wf of LEADERSHIP AND DIRECTING	wf of ENDURANCE AND MOTIVATION

TABLE 20

VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM AT STEPS 1 THROUGH 15 FOR THE FLEET TRIAL SAMPLE 1 E6's USING THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Step	*Evaluation Section*	*Justification Section*
1	Total Number of -1 Weights	Total Number of Index Terms Used
2	Sum of Variables 1 through 15	wf of PRODUCTIVITY AND ACHIEVEMENT
3	wf of PLANNING-CONTROLLING	wf of CREATIVITY AND INITIATIVE
4	wf of PRODUCTIVITY AND ACHIEVEMENT	wf of SKILLS AND ABILITIES
5	wf of ENDURANCE AND MOTIVATION	Total Number of 1 Weights
6	Total Number of 1 Weights	Total Number of -1 Weights
7	Total Number of Words in Text	wf of INTELLECTUAL FUNCTIONING
8	Total Number of Index Terms Used	wf of PROFESSIONAL AND TECHNICAL SKILLS
9	wf of CREATIVITY AND INITIATIVE	Total Number of Words in Text
10	wf of LEADERSHIP AND DIRECTING	Sum of Variables 1 through 15
11	wf of REPRESENTATION	wf of REPRESENTATION
12	wf of CONDUCT AND ATTITUDE	wf of COMMUNICATION
13	wf of COOPERATION AND RESPONSIVENESS	wf of ORGANIZATION AND STAFFING
14	Total Number of -2 Weights	wf of COOPERATION AND RESPONSIVENESS
15	wf of INTELLECTUAL FUNCTIONING	Total Number of 2 Weights

TABLE 21

SUMMARY OF VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM FOR THE SIX OCCUPATIONAL SPECIALTIES REPRESENTED IN THE FIRST E5-E6 FLEET TRIAL SAMPLE ARRANGED IN ORDER BY FREQUENCY OF CHOICE AND EARLY SELECTION
(EVALUATION SECTION - 19R)

Name of Variable	Occupational Specialty						Total
	AD	DC	ET	PN	RM	SK	
wf of ENDURANCE AND MOTIVATION	9	9	2	5	11	10	46
Total Number of Index Terms Used	14	11	15	3	5	15	63
wf of PRODUCTIVITY AND ACHIEVEMENT	1	6		11	1	3	22
wf of CONDUCT AND ATTITUDE	11	7	9	4	3		34
wf of COOPERATION AND RESPONSIVENESS	4	4	4		15	8	35
wf of INTELLECTUAL FUNCTIONING	12	2	10	7		5	36
wf of PLANNING-CONTROLLING	8	3		12	7	13	43
wf of REPRESENTATION	5	12	13	6	10		46
Total Number of Words in Text		14	14	8	4	12	52
Total Number of -1 Weights	2	1	1	2			6
wf of RECOGNITION		10		9	8	6	33
wf of LEADERSHIP AND DIRECTING	6	15			14	2	37
wf of SKILLS AND ABILITIES	13		8	10	6		37
wf of ORGANIZATION AND STAFFING		5		14	13	11	43
Total Number of 2 Weights	10		12	13		9	44
Sum of Variables 1 through 15			3	1	2		6
wf of MANAGEMENT FUNCTIONS		8			9	4	21
wf of PROFESSIONAL AND TECHNICAL SKILLS	3		7			14	24
Total Number of 1 Weights	15	13		15			43
wf of COMMUNICATION			6			1	7
wf of CREATIVITY AND INITIATIVE	7		5				12
Total Number of 3 Weights					12	7	19
Total Number of -2 Weights			11				11

NOTE: The numbers in the table represent the step at which the variable was selected. The total is the sum of the steps for all six occupational specialties.

TABLE 22

SUMMARY OF VARIABLES SELECTED BY THE STEPWISE DISCRIMINANT ANALYSIS PROGRAM FOR THE SIX OCCUPATIONAL SPECIALTIES REPRESENTED IN THE FIRST E5-E6 FLEET TRIAL SAMPLE ARRANGED IN ORDER BY FREQUENCY OF CHOICE AND EARLY SELECTION
(JUSTIFICATION SECTION - 19S)

Name of Variable	Occupational Specialty						Total
	AD	DC	ET	PN	RM	SK	
Total Number of Index Terms Used	1	1	11	2	1	1	17
wf of COOPERATION AND RESPONSIVENESS	8	2	8	11	10	5	44
wf of RECOGNITION	3	7	3	15	14	9	51
wf of MANAGEMENT FUNCTIONS	2		5	7	6	13	33
Total Number of Words in Text	15	9	1		12	7	44
wf of CREATIVITY AND INITIATIVE	5	10	12	9		11	47
wf of INTELLECTUAL FUNCTIONING	10		7	8	9	14	48
wf of PRODUCTIVITY AND ACHIEVEMENT	11		2		5	10	28
wf of ENDURANCE AND MOTIVATION	4	8	13		4		29
wf of ORGANIZATION AND STAFFING		5	15	6	7		33
Total Number of 1 Weights	13	6	6			12	37
wf of COMMUNICATION		11		12	15	2	40
wf of SKILLS AND ABILITIES	14			10	13	3	40
Total Number of -1 Weights			4	5	8		17
Sum of Variables 1 through 15			9	1		8	18
wf of LEADERSHIP AND DIRECTING		3		14		6	23
wf of PLANNING-CONTROLLING	7	4				15	26
wf of PROFESSIONAL AND TECHNICAL SKILLS				13	11	4	28
wf of CONDUCT AND ATTITUDE	12		14		3		29
wf of REPRESENTATION	9				2		11
Total Number of 2 Weights			10	3			13
Total Number of -2 Weights				4			4
Total Number of 3 Weights	6						6

NOTE: The numbers in the table represent the step at which the variable was selected. The total is the sum of the steps for all six occupational specialties.

variables used in the stepwise discriminant analysis have something to contribute to solving the classification problem. Second, a particularly differentiating variable is Total Number of Index Terms Used, attaining a rank of two for the Evaluation Section and a rank of one for the Justification Section. This variable indicates the range of skills and abilities that a petty officer manifests. Third, the number and type of adjectives and adverbs that an evaluator uses to describe the performance of the individual that is being evaluated (as reflected in the various weights) do not appear to contribute very much to differentiating among superlative first and second class petty officers and their slightly less qualified peers, whereas at the E7 pay grade level (chief petty officers) these weights are important discriminators. Fourth, there appears to be less critical observational data available at the lower pay grades upon which to base a performance evaluation, as reflected in shorter narrative comments on the Justification Section. Fifth, when both sections of narrative comments are considered together, the more discriminating variables seem to be Total Number of Index Terms Used, weighted frequency of COOPERATION AND RESPONSIVENESS, weighted frequency of ENDURANCE AND MOTIVATION, weighted frequency of PRODUCTIVITY AND ACHIEVEMENT, weighted frequency of INTELLECTUAL FUNCTIONING, weighted frequency of RECOGNITION, and Total Number of Words in Text. At Pay Grades E5 and E6, it seems reasonable that a petty officer's cooperative and responsive spirit, his endurance and motivation, his productivity and achievement, his level of intellectual functioning, and the amount of recognition he receives for his on-job performance would be more significant variables than leadership and management qualities that will be brought into play later in his career as he advances through the pay grade structure from junior to senior enlisted petty officer. A further investigation to corroborate or refute these preliminary conclusions is described in Section 6.

SECTION 3. RELIABILITY STUDY OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE

Introduction

In the pilot content analytic study of the narrative sections of Navy performance evaluations for senior enlisted personnel in Pay Grade E7, the issues of reliability and trainability were of concern, although the scope of the small initial research effort did not permit these aspects to be studied in any substantial way. Therefore, in designing the second investigation these issues were dealt with by including an original reliability study whose objectives were twofold: (1) to determine the level of agreement between pairs of individuals both of whom independently would perform a content analysis of the same corpus of Evaluation Reports, and (2) to investigate if non-researchers could be trained successfully to apply the complex content analysis methodology developed in the pilot study.[5] Kappa, weighted kappa, and product-moment correlation were the three statistics used to measure agreement between the experienced indexer and two reliability indexers A and B in their assignment of index terms and weights to the narrative text of a small corpus of 48 Evaluation Reports. The results of this original reliability study are presented in Table 23 in the upper left-hand quadrant labeled 1972 - Original Data Base: Lengthy Indexing Procedure. The value of the various agreement statistics ranged from .62 to .89 in this first reliability study. The initial expectation was that it would be extremely difficult to train nonresearch-oriented individuals to consistently index the narrative sections of Evaluation Report forms using the complex, lengthy indexing procedure that had been developed in the pilot study. The surprising result was that in only six training sessions a quite respectable level of agreement was achieved. This is a significant finding because it suggests that Navy and civilian operational personnel also can be trained to consistently apply content analytic techniques.

In the follow-on investigation to the pilot study and the second study, the original inter-indexer reliability study was extended in order to elucidate more fully the issue of reliability of the complex, lengthy indexing procedure. In the extension of the reliability study, the various agreement statistics ranged from .56 to .83, similar in magnitude to the agreement obtained in the first reliability study. These results also are shown in Table 23 in the upper right-hand quadrant labeled 1973 - Second Data Base: Lengthy Indexing Procedure and in the lower left-hand quadrant labeled 1973 - Original Data Base: Lengthy Indexing Procedure. In the second reliability study conducted in 1973, Reliability Indexers A and B were given a new and different set of 48 Evaluation Reports to index independently using the lengthy indexing procedure. This aspect of the second reliability study was included in order to test the hypothesis that with additional training and indexing experience, the level of indexing agreement could be raised. Neither Reliability Indexer A nor Reliability Indexer B was able to increase her level of agreement with the experienced indexer despite refresher training in the complex, lengthy indexing procedure and the challenge to try to outdo her previous performance. However, these two reliability indexers felt that the data base indexed by them in the second reliability study contained a sample of narrative text more

TABLE 23

LEVEL OF AGREEMENT BETWEEN THE EXPERIENCED INDEXER AND RELIABILITY INDEXERS A, B, X, Y, AND Z IN THE THREE RELIABILITY STUDIES CONDUCTED IN 1972, 1973, AND 1974*

Pairwise Comparisons Between the Experienced Indexer and Each Reliability Indexer	Agreement on Terms (κ)	Agreement on Weights (κ_ω / r_{pm})	Agreement on Terms (κ)	Agreement on Weights (κ_ω / r_{pm})
	1972 - Original Data Base Lengthy Indexing Procedure		1973 - Second Data Base Lengthy Indexing Procedure	
The Experienced Indexer vs. Reliability Indexer A	.89	.79/.83	.83	.79/.77
The Experienced Indexer vs. Reliability Indexer B	.72	.62/.66	.73	.65/.65
	1973 - Original Data Base Lengthy Indexing Procedure		1974 - Third Data Base Rational Short-Cut Indexing Procedure	
The Experienced Indexer vs. Reliability Indexer A			.89	.88/.90
The Experienced Indexer vs. Reliability Indexer B			.77	.77/.82
The Experienced Indexer vs. Reliability Indexer X	.70	.67/.63	.77	.73/.79
The Experienced Indexer vs. Reliability Indexer Y	.62	.56/.57		
The Experienced Indexer vs. Reliability Indexer Z			.53	.61/.69

* All agreement statistics reported in this table are significantly different from zero well beyond the .001 level of probability.

difficult to index than the original reliability study data base, and this greater difficulty inherent in the narrative text may have masked any gain in indexing proficiency that might have been achieved by the additional training. Another possible explanation is that Reliability Indexers A and B may have already approached the upper boundary of their indexing skill, with additional training and experience contributing very little to increasing their level of agreement with the experienced indexer.

Additionally, in the second reliability study conducted in 1973, two new reliability indexers were included, a male and a female, both in their sophomore year in college. The two new indexers, Reliability Indexers X and Y, independently indexed the same 48 Evaluation Reports that had been indexed in the first reliability study. These two individuals in essence were attempting to replicate the 1972 results, but they did not achieve as high a level of agreement with the experienced indexer as Reliability Indexers A and B did in the initial 1972 study, probably because they were less motivated and not as deeply involved in the study as were Reliability Indexers A and B who also were regular employees of R-K Research and System Design, performing a variety of clerical assignments in addition to their role as reliability indexers. However, the heartening finding in this extension of the original reliability study was that once again, in only six training sessions, a quite respectable level of agreement between indexers was achieved.

Using a subsample of 48 Evaluation Reports drawn from the E5-E6 fleet trial data base, a third reliability study was conducted in order to be certain that consistency among several indexers can be taught and achieved in their interpretation and application of the rational condensation short-cut indexing method. The level of agreement between each of the four reliability indexers and the experienced indexer who trained them was determined by the same statistical procedures used in the two earlier reliability studies in order that comparisons could be made among the three reliability studies of the magnitude of agreement that was achieved. This investigation was intended to lay the foundation for a training curriculum that may be used in the future to train Navy and civilian operational personnel in the application of the content analysis methodology.

Methodology for the Reliability Study of the Rational Condensation Short-Cut Indexing Procedure

A new training manual was prepared to explain and illustrate the proper utilization of the rational condensation short-cut indexing procedure. This training manual is reproduced in its entirety in Appendix A. It contains a discussion of the management process as it applies to Navy enlisted personnel, how the index terms used in the content analysis are to be quantified (weighted), special indexing considerations, a summary of indexing rules to be followed, and an alphabetical dictionary of the 15 index terms used in the rational condensation short-cut indexing procedure complete with definitions for each term and replete with examples of how each term in the dictionary should be used.

Four reliability indexers were trained by the experienced indexer in the application of the rational condensation short-cut indexing procedure using the training manual reproduced in Appendix A. As in the first two reliability studies, six sessions were employed to accomplish the training of the reliability indexers. These four indexers then independently indexed the narrative comments contained in a newly selected subset of 48 Evaluation Reports taken from the E5-E6 fleet trial data base. Once again, the Evaluation Section was separated from the Justification Section so that the narrative comments for each of these two sections of an Evaluation Report were not considered together. This process resulted in a group of 96 randomized pieces of narrative text---*minidocuments*---that were indexed independently by each reliability indexer. Their indexing decisions then were compared to those of the experienced indexer who trained them and whose decision-making processes they were trying to emulate. The same agreement statistics that were used in the two previous reliability studies (kappa, weighted kappa, and product-moment correlation) were computed in order to determine if the reliability of the rational condensation short-cut indexing procedure is comparable to that found in the two earlier reliability studies of the original lengthy indexing procedure. The reader is referred to earlier reports[5,6] for a detailed exposition of how the three agreement statistics were applied in determining the reliability of indexing decisions arrived at by the various indexers participating in the first two reliability studies.

Results

The kappa statistic[9] was the measure of agreement used in analyzing the index terms assigned by the four reliability indexers and the experienced indexer in the third reliability study of the rational condensation short-cut indexing procedure. For each segment of narrative text, each indexer chose a term or terms from the list of 15 possibilities, or the decision was made that no term should be used. From a careful analysis of these indexing decisions for each reliability indexer compared to the experienced indexer, it was possible to compute the kappa statistic (κ) for each of the four pairwise comparisons. These results are shown in Table 23 in the lower right-hand quadrant of the table labeled 1974 - Third Data Base: Rational Short-Cut Indexing Procedure under the column heading, Agreement on Terms.

Reliability Indexer A exceeded her performance in the 1973 reliability study and equalled her performance in the 1972 reliability study by achieving a kappa value of .89 in the selection of index terms. Reliability Indexer B exceeded her performance in both 1972 and 1973 by attaining a kappa value of .77. Reliability Indexer X also increased his performance over 1973 by achieving a kappa value of .77. From these results it is possible to conclude that consistency among several indexers can be taught and achieved in their interpretation and application of the index terms contained in the rational condensation short-cut indexing procedure as well as those contained in the lengthy indexing procedure.

Reliability Indexer Z was the only new indexer added for the 1974 study. The lower level of agreement of her selection of index terms with those of the experienced indexer (κ=.53) may be attributable to less indexing experience

than the other three reliability indexers had, but more likely to the fact that personal problems interfered with her ability to do a careful job. During the course of the 1974 reliability study, this indexer suffered a miscarriage, was in an accident, and experienced a death in her family, events which may account for the incomplete state of her work when she turned it in. She finally did find all of the missing materials and completed all of her indexing judgments. However, it is quite clear that she gave less than a conscientious performance in this study. Her agreement statistics are of interest nevertheless because they probably represent the kind of indexing performance that can be expected of an individual who might not be particularly attentive or motivated.

Analysis of the level of agreement between the experienced indexer and each of the four reliability indexers participating in the 1974 reliability study in assigning numerical weights to each index term selected, based on the modifying adjectives and adverbs, was performed differently than the analysis of the level of agreement in selecting the index terms themselves. Selection of the index terms in the three reliability studies constituted a nominal scale whereas assignment of a numerical weight to each index term selected was an indexing decision involving an ordinal scale. Therefore, more powerful agreement statistics could be employed. Since numerical weights on a scale from 3 to -2 were assigned to each index term selected, it was possible to compute a product-moment correlation coefficient (r_{pm}) between the weights assigned by the experienced indexer and by each reliability indexer. In addition, another agreement statistic, weighted kappa (κ_{ω}),[10,11] also was computed to determine if it agreed with the results of the correlational analysis. The results of the correlational analysis and the calculation of weighted kappa also are shown in Table 23 in the lower right-hand quadrant of the table labeled 1974 - Third Data Base: Rational Short-Cut Indexing Procedure under the column heading, Agreement on Weights. The results for weighted kappa are presented first, followed by the correlation coefficient after the slash mark.

Reliability Indexer A's performance in assigning weights to index terms was approximately equal in the 1972 and 1973 reliability studies using the lengthy indexing procedure. However, in 1974 using the rational condensation short-cut indexing procedure she substantially increased her agreement with the experienced indexer by achieving a weighted kappa of .88 and a correlation coefficient of .90. The same gain in agreement with the experienced indexer in assigning weights to index terms is evidenced in the results for Reliability Indexer B. Her results in the 1972 and 1973 reliability studies using the lengthy indexing procedure were essentially the same, increasing to a weighted kappa of .77 and a correlation coefficient of .82 in the 1974 reliability study where the rational condensation short-cut indexing procedure was employed. Reliability Indexer X also demonstrated better agreement with the experienced indexer in assigning weights to index terms in the 1974 reliability study using the rational condensation short-cut indexing procedure compared to the 1973 reliability study which employed the lengthy indexing procedure. This gain in indexing performance achieved by Reliability Indexers A, B, and X possibly can be attributed partially to additional indexing experience. However, a more plausible explanation is that the new training manual prepared to instruct indexers in the proper utilization of the rational con-

densation short-cut indexing procedure served its purpose well. The rational condensation short-cut indexing procedure is considerably easier to apply than the more complex, lengthy indexing procedure, and in addition the confusion over the selection of one or another index term in the lengthy indexing procedure has been eliminated in the rational condensation short-cut indexing method by combining those terms that tended to be confused or that logically belong together in management practice.[7] The assignment of weights also has been facilitated by the new training manual in that an extensive list of adjectives and adverbs falling at each point on the weighting scale is provided (see Table A-2). In addition, the rules for assigning weights were simplified so that less decision making was required of the reliability indexers. The rules for assigning weights were applied in a straightforward manner and there were fewer areas of ambiguity.

Reliability Indexer Z once again exhibited a lower level of agreement with the experienced indexer in assigning weights to index terms compared to the other three reliability indexers participating in the 1974 reliability study, although her assignment of weights to index terms was better than her selection of index terms themselves. For all of the other reliability indexers, just the opposite situation resulted, that is, better agreement with the experienced indexer was exhibited in the selection of index terms rather than in the assignment of weights to the terms selected. However, it should be kept in mind in examining this finding that the three agreement statistics reported in Table 23 are not directly comparable. Nevertheless, the values for weighted kappa and the product-moment correlation coefficient are very similar in all of the comparisons that were made.

In the computation of the various agreement statistics for the 1972 and 1973 reliability studies, those instances were not taken into account where both the experienced indexer and one of the reliability indexers had made a decision *not* to index a particular segment of narrative text because the text comprised factual information rather than evaluative comments. Actually, these instances constitute agreement between the two indexers because they both made a conscious judgment not to assign an index term (or weight) as indicated by their placing the factual text in brackets. Therefore, in the 1974 computation of the various agreement statistics, those instances where both the experienced indexer and a reliability indexer made a decision *not* to index a particular segment of narrative text were counted as agreements between the two indexers. The agreement statistics that had been computed in 1972 and 1973 in the two earlier reliability studies were adjusted to include this type of agreement that had not been included previously. The resulting effect on the magnitude of the various agreement statistics was minimal, changing them in an upward direction by only .01, .02, or .03. This adjustment to the values of the 1972 and 1973 reliability study agreement statistics as shown in Table 23 accounts for any minor differences between the reliability study results presented in this technical report and in earlier reports.[5,6]

In summary, the conclusion that can be drawn from this third reliability study is that consistency among several indexers in their interpretation and application of the rational condensation short-cut indexing procedure to the narrative comments contained in performance evaluations for naval enlisted personnel is high and better than that achieved with the lengthy indexing

procedure in two earlier reliability studies. In the 1972 and 1973 reliability studies of the lengthy indexing procedure, better agreement with the experienced indexer was exhibited in the selection of index terms compared to the assignment of weights to these terms based on the modifying adjectives and adverbs used by an evaluator. In the 1974 reliability study of the rational condensation short-cut indexing procedure, agreement with the experienced indexer was approximately the same for the selection of index terms and the assignment of weights to these terms (disregarding Reliability Indexer Z). In all three reliability studies, quite respectable levels of agreement between the experienced indexer and the various reliability indexers were achieved in only six training sessions, indicating that Navy and civilian operational personnel also should be able to learn to consistently apply the content analytic techniques developed in this research project. To this end Appendix A of this technical report presents a training manual for the rational condensation short-cut indexing procedure, and Appendix A of an earlier technical report[5] provides a training manual for the lengthy indexing procedure.

SECTION 4. VALIDATION OF THE ORIGINAL LENGTHY INDEXING PROCEDURE BY MEANS OF A SECOND INDEXER

Introduction

The results of the first two reliability studies suggested the possibility that it may be as important to consider the issue of internal consistency for a single indexer as to measure the level of agreement that can be achieved among several indexers. It seems reasonable to assume that although there may be slight differences between two indexers in how they apply a particular indexing procedure, a more important consideration is that they consistently use their own individualized interpretation of the indexing rules and conventions. One then might expect that regardless of which individualized interpretation was used to index a particular data base, a similar level of classification agreement with the criterion of on-job performance could be achieved. This is an important area to study because the findings may point to the necessity to use only one indexer for a particular data base if optimum extraction of differentiating information is to be obtained.

Methodology

In order to shed some light on this issue, a second indexer independently reindexed the 222-case cross validation sample and the 222-case generalization sample using the original lengthy indexing procedure. Thus, an exact replication of the indexing performed by the first indexer in her content analysis of the cross validation and generalization samples was carried out independently one year later.

The two sets of quantitative variables derived from the indexing decisions made by each indexer were analyzed by the stepwise discriminant analysis program (BMD07M).[8] The accuracy of classification into correct criterion group achieved by each of these two indexers was compared in order to determine if both indexers working separately with their own individualized interpretation of the indexing rules and conventions could achieve comparable classification results. The variables selected by the stepwise discriminant analysis program for the first 15 steps also were compared for the two indexers.

In addition, the possibility that two indexers sharing the indexing of the same data base can achieve as good classification results as either indexer indexing the entire data base alone was explored. The way in which this question was investigated was to duplicate the cross validation and generalization punched card decks containing the quantitative variables derived from the indexing decisions made independently by each indexer. Then the two decks were interleaved in order to create two new decks, each of which contained half of the indexing decisions of the first indexer and half of the indexing decisions of the second indexer. Both of these "half-and-half" decks also were analyzed by the stepwise discriminant analysis program and are referred to in the discussion of results as "Half and Half (E-S)" and "Half and Half (S-E)." In the first half-and-half deck, the experienced (E) indexer's judg-

ments correspond to odd-numbered cases while the second (S) indexer's judgments correspond to even-numbered cases. In the second half-and-half deck, the reverse is true, with the second indexer's judgments corresponding to odd-numbered cases and the experienced indexer's judgments corresponding to even-numbered cases.

Results

Table 24 presents a comparison of the variables selected at each step in the stepwise discriminant analysis and the classification accuracy achieved by the two indexers and the two half-and-half combinations of indexers using the original lengthy indexing procedure to index the Evaluation Section for the cross validation AT's. At Step 1 the variable, frequency (f) of COOPERATION, was selected for all four indexers/indexer half-and-half combinations. After Step 1 this unanimity is absent; however, certain variables in common were selected during Step 2 through Step 6, namely, Total Number of 3 Weights (Excellent), Total Number of -1 Weights (Poor), and frequency (f) of TECHNICAL SKILLS. Frequency (f) of LEADERSHIP AND DIRECTING and frequency (f) of PRODUCTIVITY AND ACHIEVEMENT also figure prominently as variables selected in common by the stepwise discriminant analysis process for the four indexers/indexer half-and-half combinations.

The level of classification accuracy achieved at each step in the stepwise discriminant analysis process is remarkably similar for the four indexers/indexer half-and-half combinations. A little over 40 percent of the classification problem is solved at Step 1 regardless of which indexer/indexer combination is considered, increasing asymptotically to approximately 80 percent at the step where the best classification performance was attained for each indexer/indexer combination.

A similar unanimity of results was obtained in the stepwise discriminant analysis of the Justification Section for the cross validation AT's (see Table 25). At Step 1 the variable, Total Number of Index Terms Used, was selected by the stepwise discriminant analysis process for all four indexers/indexer half-and-half combinations. After Step 1 unanimity once again is absent, but certain key variables were selected in common during Step 2 through Step 6, namely, frequency (f) or weighted frequency (wf) of ORGANIZATION, weighted frequency (wf) of SKILLS AND ABILITIES, and weighted frequency (wf) of PRODUCTIVITY AND ACHIEVEMENT.

The level of classification accuracy achieved at each step in the stepwise discriminant analysis process on the Justification Section also is remarkably similar for the four indexers/indexer half-and-half combinations, although the initial level of classification accuracy achieved is higher than that for the Evaluation Section and continues to exceed that achieved for the Evaluation Section throughout the course of the stepwise discriminant analysis process. Approximately 63 percent of the classification problem is solved at Step 1 on the Justification Section, increasing asymptotically to approximately 95 percent at the step where the best classification performance was attained for each indexer/indexer combination.

TABLE 24

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 1:		
Experienced Indexer (E)	f of COOPERATION	58
Second Indexer (S)	f of COOPERATION	57
Half and Half (E-S)	f of COOPERATION	58
Half and Half (S-E)	f of COOPERATION	57
Step 2:		
Experienced Indexer (E)	Total Number of 3 Weights	73
Second Indexer (S)	Total Number of -1 Weights	68
Half and Half (E-S)	Total Number of -1 Weights	69
Half and Half (S-E)	Total Number of 3 Weights	71
Step 3:		
Experienced Indexer (E)	f of TECHNICAL SKILLS	78
Second Indexer (S)	Total Number of 3 Weights	77
Half and Half (E-S)	Total Number of 3 Weights	78
Half and Half (S-E)	Total Number of -1 Weights	79
Step 4:		
Experienced Indexer (E)	f of LEADERSHIP AND DIRECTING	85
Second Indexer (S)	Total Number of 1 Weights	84
Half and Half (E-S)	f of LEADERSHIP AND DIRECTING	85
Half and Half (S-E)	Total Number of 1 Weights	83
Step 5:		
Experienced Indexer (E)	Total Number of -1 Weights	84
Second Indexer (S)	f of PRODUCTIVITY AND ACHIEVEMENT	87
Half and Half (E-S)	f of TECHNICAL SKILLS	83
Half and Half (S-E)	wf of RESPONSIVENESS	84
Step 6:		
Experienced Indexer (E)	wf of RESPONSIVENESS	82
Second Indexer (S)	f of TECHNICAL SKILLS	83
Half and Half (E-S)	f of PRODUCTIVITY AND ACHIEVEMENT	86
Half and Half (S-E)	f of TECHNICAL SKILLS	84

(Continued)

TABLE 24 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 7:		
Experienced Indexer (E)	f of RESOURCEFULNESS	86
Second Indexer (S)	f of PROFESSIONALISM	86
Half and Half (E-S)	Total Number of 1 Weights	84
Half and Half (S-E)	f of LEADERSHIP AND DIRECTING	84
Step 8:		
Experienced Indexer (E)	f of PRODUCTIVITY AND ACHIEVEMENT	89
Second Indexer (S)	f of LEADERSHIP AND DIRECTING	85
Half and Half (E-S)	f of SERVICE MOTIVATION	87
Half and Half (S-E)	f of PRODUCTIVITY AND ACHIEVEMENT	93
Step 9:		
Experienced Indexer (E)	f of SERVICE MOTIVATION	95
Second Indexer (S)	wf of MANAGEMENT FUNCTIONS	89
Half and Half (E-S)	wf of RELIABILITY AND DEPENDABILITY	84
Half and Half (S-E)	f of PROFESSIONALISM	88
Step 10:		
Experienced Indexer (E)	wf of TECHNICAL SKILLS	92
Second Indexer (S)	f of SERVICE MOTIVATION	90
Half and Half (E-S)	wf of RESPONSIVENESS	85
Half and Half (S-E)	f of RESPONSIVENESS	91
Step 11:		
Experienced Indexer (E)	Total Number of 2 Weights	90
Second Indexer (S)	wf of RELIABILITY AND DEPENDABILITY	89
Half and Half (E-S)	wf of PROFESSIONALISM	86
Half and Half (S-E)	f of ORGANIZATION	94
Step 12:		
Experienced Indexer (E)	f of AWARDS AND PUNISHMENT	92
Second Indexer (S)	wf of RESPONSIVENESS	91
Half and Half (E-S)	f of RESOURCEFULNESS	88
Half and Half (S-E)	wf of INTELLECTUAL FUNCTIONING	95

(Continued)

TABLE 24 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 13:		
Experienced Indexer (E)	f of PROFESSIONALISM	92
Second Indexer (S)	f of RESPONSIVENESS	92
Half and Half (E-S)	Sum of Variables 1 through 29	86
Half and Half (S-E)	wf of PLANNING	94
Step 14:		
Experienced Indexer (E)	Total Number of Index Terms Used	93
Second Indexer (S)	wf of CONTROLLING	94
Half and Half (E-S)	Total Number of Index Terms Used	85
Half and Half (S-E)	f of INTELLECTUAL FUNCTIONING	96
Step 15:		
Experienced Indexer (E)	Total Number of Words in Text	94
Second Indexer (S)	wf of INTELLECTUAL FUNCTIONING	94
Half and Half (E-S)	wf of COMMUNICATION	87
Half and Half (S-E)	f of CONDUCT, INTEGRITY, AND PRIDE	98
Step 20:		
Experienced Indexer (E)	f of ORGANIZATION	100
Second Indexer (S)	Sum of Variables 31 through 59	96
Half and Half (E-S)	f of RESPONSIVENESS	98
Half and Half (S-E)	f of AWARDS AND PUNISHMENT	99
Step 25:		
Experienced Indexer (E)	wf of PROFESSIONALISM	100
Second Indexer (S)	wf of USE OF COMMUNICATION	95
Half and Half (E-S)	wf of ASSET TO THE NAVY	104
Half and Half (S-E)	wf of MANAGEMENT FUNCTIONS	105
Best Step:		
Experienced Indexer (E)	f of INITIATIVE (*Step 48*)	110
Second Indexer (S)	f of INTELLECTUAL FUNCTIONING (*Step 58*)	112
Half and Half (E-S)	f of FLEXIBILITY (*Step 62*)	110
Half and Half (S-E)	f of CONTROLLING (*Step 54*)	116

TABLE 25

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of Index Terms Used	88
Second Indexer (S)	Total Number of Index Terms Used	86
Half and Half (E-S)	Total Number of Index Terms Used	87
Half and Half (S-E)	Total Number of Index Terms Used	87
Step 2:		
Experienced Indexer (E)	wf of TECHNICAL SKILLS	97
Second Indexer (S)	wf of ORGANIZATION	94
Half and Half (E-S)	wf of TECHNICAL SKILLS	97
Half and Half (S-E)	wf of SKILLS AND ABILITIES	90
Step 3:		
Experienced Indexer (E)	wf of PRODUCTIVITY AND ACHIEVEMENT	98
Second Indexer (S)	wf of SKILLS AND ABILITIES	93
Half and Half (E-S)	wf of PRODUCTIVITY AND ACHIEVEMENT	101
Half and Half (S-E)	f of ORGANIZATION	95
Step 4:		
Experienced Indexer (E)	wf of SKILLS AND ABILITIES	102
Second Indexer (S)	wf of PRODUCTIVITY AND ACHIEVEMENT	100
Half and Half (E-S)	wf of SKILLS AND ABILITIES	101
Half and Half (S-E)	wf of PLANNING	93
Step 5:		
Experienced Indexer (E)	f of COMMUNICATION	101
Second Indexer (S)	f of AWARDS AND PUNISHMENT	102
Half and Half (E-S)	wf of ORGANIZATION	100
Half and Half (S-E)	f of PLANNING	95
Step 6:		
Experienced Indexer (E)	wf of ORGANIZATION	100
Second Indexer (S)	wf of LEADERSHIP AND DIRECTING	101
Half and Half (E-S)	Total Number of -2 Weights	104
Half and Half (S-E)	f of LEADERSHIP AND DIRECTING	104

(Continued)

TABLE 25 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 7:		
Experienced Indexer (E)	wf of ASSET TO THE NAVY	102
Second Indexer (S)	f of SERVICE MOTIVATION	103
Half and Half (E-S)	wf of AWARDS AND PUNISHMENT	105
Half and Half (S-E)	Sum of Variables 31 through 59	104
Step 8:		
Experienced Indexer (E)	wf of REPUTE	104
Second Indexer (S)	f of PLANNING	101
Half and Half (E-S)	f of REPUTE	110
Half and Half (S-E)	wf of DRIVE	106
Step 9:		
Experienced Indexer (E)	wf of AWARDS AND PUNISHMENT	106
Second Indexer (S)	wf of PLANNING	106
Half and Half (E-S)	f of SERVICE MOTIVATION	109
Half and Half (S-E)	f of AWARDS AND PUNISHMENT	110
Step 10:		
Experienced Indexer (E)	f of INTELLECTUAL FUNCTIONING	108
Second Indexer (S)	Total Number of 2 Weights	108
Half and Half (E-S)	f of MANAGEMENT FUNCTIONS	109
Half and Half (S-E)	wf of POTENTIAL	112
Step 11:		
Experienced Indexer (E)	wf of POTENTIAL	109
Second Indexer (S)	Total Number of -1 Weights	111
Half and Half (E-S)	wf of LEADERSHIP AND DIRECTING	108
Half and Half (S-E)	wf of PROFESSIONALISM	111
Step 12:		
Experienced Indexer (E)	f of REPRESENTATION	107
Second Indexer (S)	wf of RESOURCEFULNESS	110
Half and Half (E-S)	wf of SERVICE MOTIVATION	110
Half and Half (S-E)	wf of MANAGEMENT FUNCTIONS	109

(Continued)

TABLE 25 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION AT's (N=138) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. AT's Classified Correctly
Step 13:		
Experienced Indexer (E)	Total Number of Words in Text	108
Second Indexer (S)	f of REPUTE	112
Half and Half (E-S)	f of SKILLS AND ABILITIES	110
Half and Half (S-E)	f of MANAGEMENT FUNCTIONS	111
Step 14:		
Experienced Indexer (E)	wf of RESPONSIVENESS	111
Second Indexer (S)	Total Number of -2 Weights	115
Half and Half (E-S)	Total Number of -1 Weights	110
Half and Half (S-E)	wf of LEADERSHIP AND DIRECTING	111
Step 15:		
Experienced Indexer (E)	f of RESPONSIVENESS	113
Second Indexer (S)	wf of MANAGEMENT FUNCTIONS	114
Half and Half (E-S)	f of INITIATIVE	112
Half and Half (S-E)	wf of ORGANIZATION	112
Step 20:		
Experienced Indexer (E)	f of LEADERSHIP AND DIRECTING	114
Second Indexer (S)	wf of SERVICE MOTIVATION	113
Half and Half (E-S)	f of DRIVE	113
Half and Half (S-E)	Total Number of 2 Weights	116
Step 25:		
Experienced Indexer (E)	f of ENDURANCE	116
Second Indexer (S)	Total Number of 1 Weights	116
Half and Half (E-S)	f of LEADERSHIP AND DIRECTING	116
Half and Half (S-E)	f of ENDURANCE	119
Best Step:		
Experienced Indexer (E)	wf of COMMUNICATION (*Step 46*)	129
Second Indexer (S)	wf of TECHNICAL SKILLS (*Step 56*)	134
Half and Half (E-S)	Sum of Variables 31 through 59 (*Step 64*)	130
Half and Half (S-E)	f of COMMUNICATION (*Step 63*)	135

In examining the findings from the stepwise discriminant analysis of the cross validation BT's, similar unanimity resulted. In Table 26 depicting the results for the Evaluation Section, it can be seen that the variable, Total Number of 3 Weights (Excellent), was unanimously selected at Step 1 and the variable, Total Number of Index Terms Used, was unanimously selected at Step 2. Other variables that assumed early importance on the Evaluation Section for the cross validation BT's were Total Number of -1 Weights (Poor) and frequency (f) or weighted frequency (wf) of RESOURCEFULNESS.

At Step 1 of the stepwise discriminant analysis of the Evaluation Section for the cross validation BT's, approximately 45 percent of the classification problem is solved regardless of which indexer/indexer combination is considered, increasing asymptotically to approximately 95 percent at the step where the best classification performance was attained for each indexer/indexer combination.

Paralleling the findings for the cross validation AT's on the Justification Section, the cross validation BT stepwise discriminant analysis for the Justification Section resulted in Total Number of Index Terms Used being selected unanimously at Step 1 (see Table 27). After Step 1 certain key variables were selected in common from Step 2 through Step 6, namely, frequency (f) or weighted frequency (wf) of LEADERSHIP AND DIRECTING; Sum of Variables 1 through 29; frequency (f) or weighted frequency (wf) of PRODUCTIVITY AND ACHIEVEMENT; frequency (f) or weighted frequency (wf) of CONDUCT, INTEGRITY, AND PRIDE; and frequency (f) of DRIVE.

At Step 1 on the stepwise discriminant analysis of the Justification Section for the cross validation BT's, a little over two-thirds of the classification problem is solved regardless of which indexer/indexer combination is considered, increasing asymptotically to unanimous perfect classification at the step where the best classification performance was attained for each indexer/indexer combination.

The stepwise discriminant analysis of the Evaluation Section for the generalization CS's revealed less unanimity in the variables that were selected early in the procedure (see Table 28). However, three variables were prominent in the first six steps, namely, weighted frequency (wf) of CONTROLLING, frequency (f) or weighted frequency (wf) of MANAGEMENT FUNCTIONS, and frequency (f) or weighted frequency (wf) of SKILLS AND ABILITIES. This lesser unanimity in the early selection of variables may be a result of the relatively small size of the CS sample (N=60) compared to the other three occupational specialties included in this investigation.

Because of this variation in variables selected early in the stepwise discriminant analysis of the Evaluation Section for the generalization CS's, it appears that classification accuracy also experienced a variance in the early steps of the analysis. Classification accuracy into correct criterion group at Step 1 ranged from one-third to almost one-half. However, at the step where the best classification performance was achieved for each indexer/indexer combination, 97 percent classification accuracy was unanimously attained.

TABLE 26

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=64) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of 3 Weights	39
Second Indexer (S)	Total Number of 3 Weights	37
Half and Half (E-S)	Total Number of 3 Weights	40
Half and Half (S-E)	Total Number of 3 Weights	36
Step 2:		
Experienced Indexer (E)	Total Number of Index Terms Used	52
Second Indexer (S)	Total Number of Index Terms Used	51
Half and Half (E-S)	Total Number of Index Terms Used	51
Half and Half (S-E)	Total Number of Index Terms Used	51
Step 3:		
Experienced Indexer (E)	Sum of Variables 31 through 59	53
Second Indexer (S)	Total Number of -1 Weights	51
Half and Half (E-S)	Total Number of -1 Weights	52
Half and Half (S-E)	Total Number of -1 Weights	52
Step 4:		
Experienced Indexer (E)	wf of RESOURCEFULNESS	53
Second Indexer (S)	wf of GROOMING AND ATTIRE	55
Half and Half (E-S)	Sum of Variables 31 through 59	53
Half and Half (S-E)	wf of GROOMING AND ATTIRE	55
Step 5:		
Experienced Indexer (E)	f of COOPERATION	57
Second Indexer (S)	f of RESOURCEFULNESS	56
Half and Half (E-S)	wf of REPUTE	56
Half and Half (S-E)	f of RESOURCEFULNESS	55
Step 6:		
Experienced Indexer (E)	f of RESOURCEFULNESS	58
Second Indexer (S)	wf of RESOURCEFULNESS	58
Half and Half (E-S)	f of REPUTE	54
Half and Half (S-E)	wf of RESOURCEFULNESS	57

(Continued)

TABLE 26 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=84) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 7:		
Experienced Indexer (E)	Total Number of Words in Text	60
Second Indexer (S)	f of COOPERATION	62
Half and Half (E-S)	wf of GROOMING AND ATTIRE	54
Half and Half (S-E)	f of COOPERATION	58
Step 8:		
Experienced Indexer (E)	f of AWARDS AND PUNISHMENT	58
Second Indexer (S)	f of RELIABILITY AND DEPENDABILITY	63
Half and Half (E-S)	f of INITIATIVE	55
Half and Half (S-E)	f of FLEXIBILITY	59
Step 9:		
Experienced Indexer (E)	f of ORGANIZATION	61
Second Indexer (S)	f of REPUTE	62
Half and Half (E-S)	f of TECHNICAL SKILLS	61
Half and Half (S-E)	f of INTELLECTUAL FUNCTIONING	59
Step 10:		
Experienced Indexer (E)	f of TECHNICAL SKILLS	62
Second Indexer (S)	f of REPRESENTATION	60
Half and Half (E-S)	f of ASSET TO THE NAVY	64
Half and Half (S-E)	wf of INTELLECTUAL FUNCTIONING	61
Step 11:		
Experienced Indexer (E)	f of ASSET TO THE NAVY	62
Second Indexer (S)	wf of COMMUNICATION	64
Half and Half (E-S)	wf of STAFFING	64
Half and Half (S-E)	f of RELIABILITY AND DEPENDABILITY	61
Step 12:		
Experienced Indexer (E)	wf of ASSET TO THE NAVY	64
Second Indexer (S)	f of TECHNICAL SKILLS	62
Half and Half (E-S)	f of SKILLS AND ABILITIES	64
Half and Half (S-E)	wf of RESPONSIVENESS	61

(Continued)

TABLE 26 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=84) - EVALUATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 13:		
Experienced Indexer (E)	wf of FLEXIBILITY	64
Second Indexer (S)	f of ASSET TO THE NAVY	65
Half and Half (E-S)	f of RELIABILITY AND DEPENDABILITY	68
Half and Half (S-E)	f of SKILLS AND ABILITIES	65
Step 14:		
Experienced Indexer (E)	wf of REPUTE	62
Second Indexer (S)	wf of ASSET TO THE NAVY	66
Half and Half (E-S)	wf of RELIABILITY AND DEPENDABILITY	68
Half and Half (S-E)	wf of PRODUCTIVITY AND ACHIEVEMENT	65
Step 15:		
Experienced Indexer (E)	f of STAFFING	65
Second Indexer (S)	wf of STAFFING	67
Half and Half (E-S)	wf of CONDUCT, INTEGRITY, AND PRIDE	67
Half and Half (S-E)	wf of ORGANIZATION	64
Step 20:		
Experienced Indexer (E)	f of PROFESSIONALISM	69
Second Indexer (S)	f of DRIVE	66
Half and Half (E-S)	wf of AWARDS AND PUNISHMENT	70
Half and Half (S-E)	Total Number of 1 Weights	66
Step 25:		
Experienced Indexer (E)	wf of DRIVE	71
Second Indexer (S)	f of CONTROLLING	76
Half and Half (E-S)	wf of COOPERATION	76
Half and Half (S-E)	wf of DRIVE	73
Best Step:		
Experienced Indexer (E)	f of COOPERATION (*Step 62*)	82
Second Indexer (S)	wf of SERVICE MOTIVATION (*Step 50*)	78
Half and Half (E-S)	wf of USE OF COMMUNICATION (*Step 54*)	81
Half and Half (S-E)	wf of CONDUCT, INTEGRITY, AND PRIDE (*Step 62*)	80

TABLE 27

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=84) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of Index Terms Used	58
Second Indexer (S)	Total Number of Index Terms Used	57
Half and Half (E-S)	Total Number of Index Terms Used	58
Half and Half (S-E)	Total Number of Index Terms Used	57
Step 2:		
Experienced Indexer (E)	wf of LEADERSHIP AND DIRECTING	61
Second Indexer (S)	Sum of Variables 1 through 29	55
Half and Half (E-S)	wf of LEADERSHIP AND DIRECTING	64
Half and Half (S-E)	Sum of Variables 1 through 29	58
Step 3:		
Experienced Indexer (E)	Sum of Variables 1 through 29	58
Second Indexer (S)	f of LEADERSHIP AND DIRECTING	58
Half and Half (E-S)	Sum of Variables 1 through 29	61
Half and Half (S-E)	wf of LEADERSHIP AND DIRECTING	59
Step 4:		
Experienced Indexer (E)	f of PRODUCTIVITY AND ACHIEVEMENT	61
Second Indexer (S)	wf of PRODUCTIVITY AND ACHIEVEMENT	65
Half and Half (E-S)	f of PRODUCTIVITY AND ACHIEVEMENT	60
Half and Half (S-E)	wf of PRODUCTIVITY AND ACHIEVEMENT	65
Step 5:		
Experienced Indexer (E)	wf of CONDUCT, INTEGRITY, AND PRIDE	63
Second Indexer (S)	f of DRIVE	64
Half and Half (E-S)	f of DRIVE	63
Half and Half (S-E)	wf of CONDUCT, INTEGRITY, AND PRIDE	66
Step 6:		
Experienced Indexer (E)	f of DRIVE	66
Second Indexer (S)	wf of CONDUCT, INTEGRITY, AND PRIDE	64
Half and Half (E-S)	f of CONDUCT, INTEGRITY, AND PRIDE	64
Half and Half (S-E)	f of DRIVE	67

(Continued)

TABLE 27 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=84) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 7:		
Experienced Indexer (E)	wf of SERVICE MOTIVATION	66
Second Indexer (S)	f of USE OF COMMUNICATION	67
Half and Half (E-S)	f of INITIATIVE	70
Half and Half (S-E)	wf of DRIVE	67
Step 8:		
Experienced Indexer (E)	f of INITIATIVE	72
Second Indexer (S)	wf of ASSET TO THE NAVY	68
Half and Half (E-S)	wf of REPUTE	73
Half and Half (S-E)	f of RESPONSIVENESS	70
Step 9:		
Experienced Indexer (E)	f of RESPONSIVENESS	74
Second Indexer (S)	wf of MANAGEMENT FUNCTIONS	72
Half and Half (E-S)	wf of ASSET TO THE NAVY	76
Half and Half (S-E)	wf of ENDURANCE	70
Step 10:		
Experienced Indexer (E)	f of ASSET TO THE NAVY	71
Second Indexer (S)	wf of REPUTE	72
Half and Half (E-S)	f of MANAGEMENT FUNCTIONS	74
Half and Half (S-E)	wf of INTELLECTUAL FUNCTIONING	70
Step 11:		
Experienced Indexer (E)	wf of DRIVE	75
Second Indexer (S)	f of ORGANIZATION	72
Half and Half (E-S)	wf of RESOURCEFULNESS	74
Half and Half (S-E)	f of COMMUNICATION	70
Step 12:		
Experienced Indexer (E)	wf of RESOURCEFULNESS	78
Second Indexer (S)	wf of INTELLECTUAL FUNCTIONING	69
Half and Half (E-S)	f of REPUTE	74
Half and Half (S-E)	wf of ASSET TO THE NAVY	73

(Continued)

TABLE 27 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
CROSS VALIDATION BT's (N=84) - JUSTIFICATION SECTION

	Variable Selected	No. of Cross Valid. BT's Classified Correctly
Step 13:		
Experienced Indexer (E)	f of RESOURCEFULNESS	76
Second Indexer (S)	wf of STAFFING	74
Half and Half (E-S)	Total Number of 2 Weights	74
Half and Half (S-E)	f of FLEXIBILITY	73
Step 14:		
Experienced Indexer (E)	f of PROFESSIONALISM	77
Second Indexer (S)	f of STAFFING	73
Half and Half (E-S)	wf of STAFFING	74
Half and Half (S-E)	wf of FLEXIBILITY	75
Step 15:		
Experienced Indexer (E)	f of REPRESENTATION	76
Second Indexer (S)	Total Number of 3 Weights	75
Half and Half (E-S)	f of ENDURANCE	73
Half and Half (S-E)	wf of COMMUNICATION	74
Step 20:		
Experienced Indexer (E)	f of REPUTE	79
Second Indexer (S)	wf of ENDURANCE	80
Half and Half (E-S)	f of TECHNICAL SKILLS	78
Half and Half (S-E)	f of INITIATIVE	77
Step 25:		
Experienced Indexer (E)	f of PLANNING	80
Second Indexer (S)	f of ASSET TO THE NAVY	84
Half and Half (E-S)	wf of MANAGEMENT FUNCTIONS	81
Half and Half (S-E)	f of LEADERSHIP AND DIRECTING	80
Best Step:		
Experienced Indexer (E)	wf of RELIABILITY AND DEPENDABILITY (*Step 46*)	84
Second Indexer (S)	f of ASSET TO THE NAVY (*Step 25*)	84
Half and Half (E-S)	wf of SKILLS AND ABILITIES (*Step 60*)	84
Half and Half (S-E)	f of RESOURCEFULNESS (*Step 36*)	84

TABLE 28

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 1:		
Experienced Indexer (E)	wf of CONTROLLING	20
Second Indexer (S)	wf of RESPONSIVENESS	27
Half and Half (E-S)	wf of MANAGEMENT FUNCTIONS	28
Half and Half (S-E)	wf of CONTROLLING	20
Step 2:		
Experienced Indexer (E)	wf of ASSET TO THE NAVY	28
Second Indexer (S)	wf of CONTROLLING	29
Half and Half (E-S)	wf of ASSET TO THE NAVY	30
Half and Half (S-E)	wf of RESPONSIVENESS	26
Step 3:		
Experienced Indexer (E)	f of MANAGEMENT FUNCTIONS	30
Second Indexer (S)	wf of SKILLS AND ABILITIES	29
Half and Half (E-S)	wf of SKILLS AND ABILITIES	30
Half and Half (S-E)	wf of SERVICE MOTIVATION	30
Step 4:		
Experienced Indexer (E)	wf of SKILLS AND ABILITIES	30
Second Indexer (S)	Total Number of Words in Text	34
Half and Half (E-S)	Total Number of Index Terms Used	31
Half and Half (S-E)	Total Number of 1 Weights	31
Step 5:		
Experienced Indexer (E)	Total Number of Index Terms Used	32
Second Indexer (S)	f of MANAGEMENT FUNCTIONS	33
Half and Half (E-S)	wf of ENDURANCE	33
Half and Half (S-E)	f of CONDUCT, INTEGRITY, AND PRIDE	32
Step 6:		
Experienced Indexer (E)	f of ENDURANCE	34
Second Indexer (S)	wf of CONDUCT, INTEGRITY, AND PRIDE	34
Half and Half (E-S)	f of ASSET TO THE NAVY	36
Half and Half (S-E)	f of SKILLS AND ABILITIES	29

(Continued)

TABLE 28 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 7:		
Experienced Indexer (E)	Sum of Variables 31 through 59	38
Second Indexer (S)	f of PLANNING	37
Half and Half (E-S)	f of PLANNING	41
Half and Half (S-E)	Total Number of Words in Text	34
Step 8:		
Experienced Indexer (E)	wf of ORGANIZATION	39
Second Indexer (S)	f of ENDURANCE	39
Half and Half (E-S)	wf of CONDUCT, INTEGRITY, AND PRIDE	40
Half and Half (S-E)	wf of CONDUCT, INTEGRITY, AND PRIDE	38
Step 9:		
Experienced Indexer (E)	wf of POTENTIAL	42
Second Indexer (S)	f of COMMUNICATION	41
Half and Half (E-S)	f of RESOURCEFULNESS	42
Half and Half (S-E)	wf of INITIATIVE	39
Step 10:		
Experienced Indexer (E)	wf of PLANNING	43
Second Indexer (S)	f of GROOMING AND ATTIRE	41
Half and Half (E-S)	f of CONDUCT, INTEGRITY, AND PRIDE	42
Half and Half (S-E)	f of COMMUNICATION	40
Step 11:		
Experienced Indexer (E)	f of SERVICE MOTIVATION	46
Second Indexer (S)	wf of INITIATIVE	43
Half and Half (E-S)	Total Number of 3 Weights	44
Half and Half (S-E)	f of MANAGEMENT FUNCTIONS	39
Step 12:		
Experienced Indexer (E)	f of PLANNING	41
Second Indexer (S)	f of COOPERATION	45
Half and Half (E-S)	wf of POTENTIAL	49
Half and Half (S-E)	f of PLANNING	41

(Continued)

TABLE 28 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 13:		
Experienced Indexer (E)	Total Number of 1 Weights	44
Second Indexer (S)	wf of RELIABILITY AND DEPENDABILITY	43
Half and Half (E-S)	f of RESPONSIVENESS	46
Half and Half (S-E)	f of ENDURANCE	44
Step 14:		
Experienced Indexer (E)	f of LEADERSHIP AND DIRECTING	43
Second Indexer (S)	Total Number of 1 Weights	43
Half and Half (E-S)	wf of RELIABILITY AND DEPENDABILITY	48
Half and Half (S-E)	f of GROOMING AND ATTIRE	46
Step 15:		
Experienced Indexer (E)	f of INITIATIVE	44
Second Indexer (S)	wf of PRODUCTIVITY AND ACHIEVEMENT	47
Half and Half (E-S)	f of RELIABILITY AND DEPENDABILITY	48
Half and Half (S-E)	wf of PRODUCTIVITY AND ACHIEVEMENT	46
Step 20:		
Experienced Indexer (E)	f of INTELLECTUAL FUNCTIONING	50
Second Indexer (S)	f of RELIABILITY AND DEPENDABILITY	49
Half and Half (E-S)	Total Number of 2 Weights	48
Half and Half (S-E)	wf of COOPERATION	47
Step 25:		
Experienced Indexer (E)	wf of COOPERATION	51
Second Indexer (S)	wf of DRIVE	52
Half and Half (E-S)	wf of DRIVE	49
Half and Half (S-E)	wf of POTENTIAL	52
Best Step:		
Experienced Indexer (E)	f of COMMUNICATION (*Step 44*)	58
Second Indexer (S)	wf of RESOURCEFULNESS (*Step 52*)	58
Half and Half (E-S)	f of POTENTIAL (*Step 52*)	58
Half and Half (S-E)	wf of ORGANIZATION (*Step 54*)	58

Unanimity in the early selection of variables once again comes into play in examining the results of the stepwise discriminant analysis of the generalization CS's on the Justification Section (see Table 29). At Step 1 Total Number of Index Terms Used was the variable selected for all four indexers/indexer half-and-half combinations. At Step 2 frequency (f) of PROFESSIONALISM was unanimously selected. In the next few steps weighted frequency (wf) of COMMUNICATION and weighted frequency (wf) of REPRESENTATION are prominent.

Approximately two-thirds of the generalization CS's were classified into correct criterion group at Step 1 for the Justification Section, regardless of which indexer/indexer combination is considered. At the step where the best classification performance was attained for each indexer/indexer combination, perfect classification was achieved unanimously.

On the Evaluation Section for the generalization RM's, quite remarkable unanimity was achieved in the selection of variables at the first three steps in the stepwise discriminant analysis procedure (see Table 30). Total Number of -1 Weights (Poor) was selected unanimously at Step 1. At Step 2 weighted frequency (wf) of AWARDS AND PUNISHMENT was selected unanimously, and weighted frequency (wf) of POTENTIAL was the variable unanimously selected at Step 3. Total Number of 3 Weights (Excellent) and frequency (f) of RELIABILITY AND DEPENDABILITY also were prominent in the early selection of variables.

Forty-three percent of the generalization RM's were classified correctly on the Evaluation Section at Step 1, all four indexers/indexer half-and-half combinations being identical in this regard. Classification performance continued to improve asymptotically to a maximum of approximately 80 percent at the step where the best classification performance was attained for each indexer/indexer combination.

Remarkable unanimity also was achieved in the early selection of variables in the stepwise discriminant analysis of the generalization RM's on the Justification Section (see Table 31). Total Number of Index Terms Used was selected unanimously at Step 1. At Step 2 Sum of Variables 31 through 59 was the variable unanimously selected, and frequency (f) or weighted frequency (wf) of PRODUCTIVITY AND ACHIEVEMENT was selected unanimously at either Step 3 or Step 4. Other variables figuring prominently in early selection by the stepwise discriminant analysis procedure were frequency (f) of COOPERATION, frequency (f) or weighted frequency (wf) of ENDURANCE, and weighted frequency (wf) of GROOMING AND ATTIRE.

Approximately 65 percent of the generalization RM's were classified correctly on the Justification Section at Step 1, regardless of which indexer/indexer combination is considered. Classification performance continued to improve asymptotically to a maximum of approximately 90 percent at the step where the best classification performance was attained for each indexer/indexer combination.

It is quite clear from these results that the two indexers who independently indexed the cross validation and generalization samples using the lengthy indexing procedure arrived at very similar indexing decisions, as

TABLE 29

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of Index Terms Used	42
Second Indexer (S)	Total Number of Index Terms Used	39
Half and Half (E-S)	Total Number of Index Terms Used	39
Half and Half (S-E)	Total Number of Index Terms Used	41
Step 2:		
Experienced Indexer (E)	f of PROFESSIONALISM	44
Second Indexer (S)	f of PROFESSIONALISM	39
Half and Half (E-S)	f of PROFESSIONALISM	39
Half and Half (S-E)	f of PROFESSIONALISM	44
Step 3:		
Experienced Indexer (E)	f of INITIATIVE	44
Second Indexer (S)	wf of COMMUNICATION	45
Half and Half (E-S)	wf of COMMUNICATION	45
Half and Half (S-E)	f of INITIATIVE	43
Step 4:		
Experienced Indexer (E)	wf of COMMUNICATION	47
Second Indexer (S)	wf of REPRESENTATION	46
Half and Half (E-S)	wf of REPRESENTATION	46
Half and Half (S-E)	wf of COMMUNICATION	47
Step 5:		
Experienced Indexer (E)	wf of REPRESENTATION	47
Second Indexer (S)	wf of MANAGEMENT FUNCTIONS	48
Half and Half (E-S)	f of SKILLS AND ABILITIES	47
Half and Half (S-E)	wf of REPRESENTATION	47
Step 6:		
Experienced Indexer (E)	wf of COOPERATION	47
Second Indexer (S)	wf of TECHNICAL SKILLS	50
Half and Half (E-S)	f of TECHNICAL SKILLS	47
Half and Half (S-E)	wf of LEADERSHIP AND DIRECTING	47

(Continued)

TABLE 29 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 7:		
Experienced Indexer (E)	f of CONTROLLING	50
Second Indexer (S)	wf of PRODUCTIVITY AND ACHIEVEMENT	52
Half and Half (E-S)	wf of INITIATIVE	48
Half and Half (S-E)	f of MANAGEMENT FUNCTIONS	49
Step 8:		
Experienced Indexer (E)	f of POTENTIAL	51
Second Indexer (S)	f of ASSET TO THE NAVY	52
Half and Half (E-S)	f of PRODUCTIVITY AND ACHIEVEMENT	50
Half and Half (S-E)	wf of COOPERATION	49
Step 9:		
Experienced Indexer (E)	f of PRODUCTIVITY AND ACHIEVEMENT	55
Second Indexer (S)	wf of USE OF COMMUNICATION	53
Half and Half (E-S)	Total Number of 1 Weights	55
Half and Half (S-E)	f of RESPONSIVENESS	52
Step 10:		
Experienced Indexer (E)	wf of SKILLS AND ABILITIES	53
Second Indexer (S)	f of SKILLS AND ABILITIES	52
Half and Half (E-S)	wf of PRODUCTIVITY AND ACHIEVEMENT	55
Half and Half (S-E)	wf of PRODUCTIVITY AND ACHIEVEMENT	53
Step 11:		
Experienced Indexer (E)	wf of PLANNING	54
Second Indexer (S)	wf of INITIATIVE	53
Half and Half (E-S)	wf of USE OF COMMUNICATION	57
Half and Half (S-E)	Total Number of 1 Weights	55
Step 12:		
Experienced Indexer (E)	Total Number of Words in Text	54
Second Indexer (S)	f of TECHNICAL SKILLS	53
Half and Half (E-S)	wf of MANAGEMENT FUNCTIONS	56
Half and Half (S-E)	wf of INITIATIVE	56

(Continued)

TABLE 29 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION CS's (N=60) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n CS's Classified Correctly
Step 13:		
Experienced Indexer (E)	wf of PROFESSIONALISM	55
Second Indexer (S)	wf of RESOURCEFULNESS	53
Half and Half (E-S)	wf of TECHNICAL SKILLS	57
Half and Half (S-E)	f of REPRESENTATION	56
Step 14:		
Experienced Indexer (E)	f of SKILLS AND ABILITIES	56
Second Indexer (S)	f of PRODUCTIVITY AND ACHIEVEMENT	55
Half and Half (E-S)	f of DRIVE	56
Half and Half (S-E)	wf of POTENTIAL	55
Step 15:		
Experienced Indexer (E)	f of RELIABILITY AND DEPENDABILITY	56
Second Indexer (S)	f of DRIVE	57
Half and Half (E-S)	f of REPRESENTATION	57
Half and Half (S-E)	f of PRODUCTIVITY AND ACHIEVEMENT	52
Step 20:		
Experienced Indexer (E)	f of SERVICE MOTIVATION	58
Second Indexer (S)	f of POTENTIAL	57
Half and Half (E-S)	wf of SERVICE MOTIVATION	58
Half and Half (S-E)	wf of RESPONSIVENESS	55
Step 25:		
Experienced Indexer (E)	wf of STAFFING	58
Second Indexer (S)	Total Number of Words in Text	60
Half and Half (E-S)	f of COMMUNICATION	60
Half and Half (S-E)	wf of TECHNICAL SKILLS	59
Best Step:		
Experienced Indexer (E)	wf of POTENTIAL (*Step 35*)	60
Second Indexer (S)	Total Number of Words in Text (*Step 25*)	60
Half and Half (E-S)	f of COMMUNICATION (*Step 25*)	60
Half and Half (S-E)	wf of MANAGEMENT FUNCTIONS (*Step 40*)	60

TABLE 30

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION RM's (N=162) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of -1 Weights	70
Second Indexer (S)	Total Number of -1 Weights	70
Half and Half (E-S)	Total Number of -1 Weights	70
Half and Half (S-E)	Total Number of -1 Weights	70
Step 2:		
Experienced Indexer (E)	wf of AWARDS AND PUNISHMENT	79
Second Indexer (S)	wf of AWARDS AND PUNISHMENT	80
Half and Half (E-S)	wf of AWARDS AND PUNISHMENT	80
Half and Half (S-E)	wf of AWARDS AND PUNISHMENT	79
Step 3:		
Experienced Indexer (E)	wf of POTENTIAL	87
Second Indexer (S)	wf of POTENTIAL	91
Half and Half (E-S)	wf of POTENTIAL	85
Half and Half (S-E)	wf of POTENTIAL	87
Step 4:		
Experienced Indexer (E)	wf of MANAGEMENT FUNCTIONS	88
Second Indexer (S)	f of RESPONSIVENESS	93
Half and Half (E-S)	f of RESPONSIVENESS	87
Half and Half (S-E)	Total Number of 3 Weights	91
Step 5:		
Experienced Indexer (E)	Total Number of 3 Weights	91
Second Indexer (S)	Total Number of 3 Weights	97
Half and Half (E-S)	wf of MANAGEMENT FUNCTIONS	93
Half and Half (S-E)	f of RELIABILITY AND DEPENDABILITY	93
Step 6:		
Experienced Indexer (E)	f of RELIABILITY AND DEPENDABILITY	100
Second Indexer (S)	f of RELIABILITY AND DEPENDABILITY	103
Half and Half (E-S)	f of MANAGEMENT FUNCTIONS	94
Half and Half (S-E)	f of FLEXIBILITY	93

(Continued)

TABLE 30 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS USING THE ORIGINAL LENGTHY INDEXING PROCEDURE

GENERALIZATION RM's (N=162) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 7:		
Experienced Indexer (E)	f of COMMUNICATION	103
Second Indexer (S)	wf of CONTROLLING	99
Half and Half (E-S)	f of RELIABILITY AND DEPENDABILITY	96
Half and Half (S-E)	wf of CONTROLLING	95
Step 8:		
Experienced Indexer (E)	f of POTENTIAL	99
Second Indexer (S)	wf of REPUTE	98
Half and Half (E-S)	Total Number of 3 Weights	100
Half and Half (S-E)	wf of REPUTE	99
Step 9:		
Experienced Indexer (E)	wf of REPUTE	95
Second Indexer (S)	wf of ENDURANCE	99
Half and Half (E-S)	wf of REPUTE	102
Half and Half (S-E)	wf of ENDURANCE	98
Step 10:		
Experienced Indexer (E)	f of REPUTE	94
Second Indexer (S)	Total Number of 2 Weights	105
Half and Half (E-S)	wf of SKILLS AND ABILITIES	103
Half and Half (S-E)	Total Number of Words in Text	96
Step 11:		
Experienced Indexer (E)	f of INTELLECTUAL FUNCTIONING	92
Second Indexer (S)	f of INITIATIVE	109
Half and Half (E-S)	f of ORGANIZATION	104
Half and Half (S-E)	wf of MANAGEMENT FUNCTIONS	100
Step 12:		
Experienced Indexer (E)	f of RESPONSIVENESS	98
Second Indexer (S)	wf of MANAGEMENT FUNCTIONS	107
Half and Half (E-S)	f of POTENTIAL	106
Half and Half (S-E)	f of REPRESENTATION	103

(Continued)

TABLE 30 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION RM's (N=162) - EVALUATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 13:		
Experienced Indexer (E)	wf of RESPONSIVENESS	99
Second Indexer (S)	f of CONTROLLING	109
Half and Half (E-S)	wf of CONTROLLING	111
Half and Half (S-E)	wf of STAFFING	102
Step 14:		
Experienced Indexer (E)	wf of SERVICE MOTIVATION	99
Second Indexer (S)	wf of DRIVE	106
Half and Half (E-S)	f of PLANNING	112
Half and Half (S-E)	f of INITIATIVE	104
Step 15:		
Experienced Indexer (E)	wf of PRODUCTIVITY AND ACHIEVEMENT	105
Second Indexer (S)	f of MANAGEMENT FUNCTIONS	109
Half and Half (E-S)	wf of SERVICE MOTIVATION	113
Half and Half (S-E)	f of SERVICE MOTIVATION	106
Step 20:		
Experienced Indexer (E)	wf of PLANNING	107
Second Indexer (S)	f of FLEXIBILITY	115
Half and Half (E-S)	f of REPRESENTATION	115
Half and Half (S-E)	wf of DRIVE	114
Step 25:		
Experienced Indexer (E)	wf of SKILLS AND ABILITIES	113
Second Indexer (S)	f of REPUTE	122
Half and Half (E-S)	wf of COMMUNICATION	115
Half and Half (S-E)	wf of PROFESSIONALISM	122
Best Step:		
Experienced Indexer (E)	f of INTELLECTUAL FUNCTIONING (Removed) (*Step 63*)	131
Second Indexer (S)	Sum of Variables 31 through 59 (*Step 46*)	128
Half and Half (E-S)	f of GROOMING AND ATTIRE (*Step 60*)	130
Half and Half (S-E)	wf of SKILLS AND ABILITIES (*Step 56*)	133

TABLE 31

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION RM's (N=162) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 1:		
Experienced Indexer (E)	Total Number of Index Terms Used	103
Second Indexer (S)	Total Number of Index Terms Used	104
Half and Half (E-S)	Total Number of Index Terms Used	105
Half and Half (S-E)	Total Number of Index Terms Used	102
Step 2:		
Experienced Indexer (E)	Sum of Variables 31 through 59	105
Second Indexer (S)	Sum of Variables 31 through 59	105
Half and Half (E-S)	Sum of Variables 31 through 59	106
Half and Half (S-E)	Sum of Variables 31 through 59	104
Step 3:		
Experienced Indexer (E)	wf of PRODUCTIVITY AND ACHIEVEMENT	110
Second Indexer (S)	wf of PRODUCTIVITY AND ACHIEVEMENT	114
Half and Half (E-S)	f of PRODUCTIVITY AND ACHIEVEMENT	110
Half and Half (S-E)	wf of PRODUCTIVITY AND ACHIEVEMENT	113
Step 4:		
Experienced Indexer (E)	f of PRODUCTIVITY AND ACHIEVEMENT	114
Second Indexer (S)	f of PRODUCTIVITY AND ACHIEVEMENT	117
Half and Half (E-S)	wf of PRODUCTIVITY AND ACHIEVEMENT	113
Half and Half (S-E)	f of PRODUCTIVITY AND ACHIEVEMENT	117
Step 5:		
Experienced Indexer (E)	f of COOPERATION	117
Second Indexer (S)	f of ENDURANCE	122
Half and Half (E-S)	f of COOPERATION	120
Half and Half (S-E)	f of COOPERATION	119
Step 6:		
Experienced Indexer (E)	wf of GROOMING AND ATTIRE	123
Second Indexer (S)	wf of GROOMING AND ATTIRE	123
Half and Half (E-S)	f of CONTROLLING	122
Half and Half (S-E)	wf of GROOMING AND ATTIRE	125

(Continued)

TABLE 31 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION RM's (N=162) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 7:		
Experienced Indexer (E)	wf of STAFFING	127
Second Indexer (S)	f of COOPERATION	123
Half and Half (E-S)	Total Number of 1 Weights	125
Half and Half (S-E)	f of ENDURANCE	125
Step 8:		
Experienced Indexer (E)	wf of ENDURANCE	130
Second Indexer (S)	f of CONTROLLING	125
Half and Half (E-S)	wf of RESOURCEFULNESS	127
Half and Half (S-E)	wf of PLANNING	125
Step 9:		
Experienced Indexer (E)	f of STAFFING	131
Second Indexer (S)	f of PLANNING	126
Half and Half (E-S)	f of TECHNICAL SKILLS	130
Half and Half (S-E)	f of STAFFING	4
Step 10:		
Experienced Indexer (E)	wf of PLANNING	134
Second Indexer (S)	wf of RESOURCEFULNESS	132
Half and Half (E-S)	f of RESOURCEFULNESS	131
Half and Half (S-E)	wf of STAFFING	126
Step 11:		
Experienced Indexer (E)	Total Number of 2 Weights	129
Second Indexer (S)	f of RESOURCEFULNESS	132
Half and Half (E-S)	f of POTENTIAL	130
Half and Half (S-E)	Total Number of Words in Text	133
Step 12:		
Experienced Indexer (E)	f of POTENTIAL	130
Second Indexer (S)	wf of CONTROLLING	131
Half and Half (E-S)	f of REPUTE	129
Half and Half (S-E)	wf of MANAGEMENT FUNCTIONS	131

(Continued)

TABLE 31 (CONT.)

COMPARISON OF THE VARIABLES SELECTED AT EACH STEP
IN THE STEPWISE DISCRIMINANT ANALYSIS AND THE
CLASSIFICATION ACCURACY ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE
GENERALIZATION RM's (N=162) - JUSTIFICATION SECTION

	Variable Selected	No. of Generalizat'n RM's Classified Correctly
Step 13:		
Experienced Indexer (E)	f of INITIATIVE	130
Second Indexer (S)	f of COMMUNICATION	132
Half and Half (E-S)	wf of STAFFING	129
Half and Half (S-E)	f of MANAGEMENT FUNCTIONS	131
Step 14:		
Experienced Indexer (E)	wf of TECHNICAL SKILLS	133
Second Indexer (S)	f of REPUTE	134
Half and Half (E-S)	wf of GROOMING AND ATTIRE	127
Half and Half (S-E)	f of COMMUNICATION	132
Step 15:		
Experienced Indexer (E)	f of REPUTE	132
Second Indexer (S)	wf of COMMUNICATION	134
Half and Half (E-S)	wf of CONTROLLING	127
Half and Half (S-E)	f of RESPONSIVENESS	134
Step 20:		
Experienced Indexer (E)	wf of PROFESSIONALISM	142
Second Indexer (S)	f of LEADERSHIP AND DIRECTING	135
Half and Half (E-S)	f of INITIATIVE	133
Half and Half (S-E)	f of POTENTIAL	135
Step 25:		
Experienced Indexer (E)	wf of USE OF COMMUNICATION	136
Second Indexer (S)	f of ASSET TO THE NAVY	136
Half and Half (E-S)	wf of ENDURANCE	136
Half and Half (S-E)	wf of INITIATIVE	138
Best Step:		
Experienced Indexer (E)	wf of FLEXIBILITY (*Step 40*)	144
Second Indexer (S)	f of POTENTIAL (*Step 38*)	141
Half and Half (E-S)	f of GROOMING AND ATTIRE (*Step 58*)	148
Half and Half (S-E)	f of TECHNICAL SKILLS (*Step 44*)	140

reflected in the unanimity of variables selected early by the stepwise discriminant analysis procedure and in the similar classification accuracy achieved at each step in the stepwise discriminant analysis process. For the four occupational specialties represented in the cross validation and generalization samples, no variable in common for all four indexers/indexer half-and-half combinations was selected early on the Evaluation Section. However, two variables were selected early for three of the four indexers/indexer half-and-half combinations, namely, Total Number of 3 Weights (Excellent) and Total Number of -1 Weights (Poor). This finding suggests that on the Evaluation Section the adjectives and adverbs that an evaluator uses to describe the performance of an individual that is being evaluated are the most important characteristics of the narrative text for differentiating between superlative chief petty officers and their slightly less qualified colleagues. Other key variables are specific to each of the four occupational specialties and corroborate the findings in earlier studies.[6]

On the Justification Section the variable unanimously selected at Step 1 for all four occupational specialties represented in the cross validation and generalization samples was Total Number of Index Terms Used. This variable without exception also was selected first for the Justification Section in earlier studies of these same four occupational specialties.[6] This variable reflects the variety of specific areas of an individual's performance that an evaluator chose to comment on, and is measured by the number of different index terms chosen by the indexer to encompass the narrative content. The initial choice of this variable for the Justification Section also is a reflection of the fact that the narrative comments on the Justification Section typically are longer than those on the Evaluation Section. This finding indicates once again that the range of skills and abilities that a chief petty officer manifests is a key factor in his superior performance as narrated by the evaluator in the Justification Section. Productivity and Achievement also was a variable selected early on the Justification Section for three of the four indexers/indexer half-and-half combinations. Other key variables are specific to each of the four occupational specialties and parallel the results in earlier studies.[6]

A recapitulation of the classification accuracy achieved by the four indexers/indexer half-and-half combinations using the original lengthy indexing procedure is provided in Table 32. The similarity of classification accuracy achieved is striking for all four occupational specialties studied on both the Evaluation Section and the Justification Section. Without exception better classification was achieved in the content analysis of the narrative comments in the Justification Section compared to the Evaluation Section. These results replicate the findings in earlier studies of these same four occupational specialties.[6]

The conclusion that can be drawn from this investigation is that regardless of which individualized interpretation of the indexing rules and conventions that may be used to index a particular data base of narrative performance evaluations, a similar level of classification agreement with the criterion of on-job performance can be expected. Furthermore, it can be concluded that two indexers sharing the indexing of the same data base can be

TABLE 32

RECAPITULATION OF THE CLASSIFICATION ACCURACY
ACHIEVED BY THE VARIOUS INDEXERS
USING THE ORIGINAL LENGTHY INDEXING PROCEDURE

Sample	Indexer	Classification Accuracy
CROSS VALIDATION AT's		
Evaluation Section	Experienced Indexer (E)	110 out of 138 (80%)
	Second Indexer (S)	112 out of 138 (81%)
	Half and Half (E-S)	110 out of 138 (80%)
	Half and Half (S-E)	116 out of 138 (84%)
Justification Section	Experienced Indexer (E)	129 out of 138 (93%)
	Second Indexer (S)	134 out of 138 (97%)
	Half and Half (E-S)	130 out of 138 (94%)
	Half and Half (S-E)	135 out of 138 (98%)
CROSS VALIDATION BT's		
Evaluation Section	Experienced Indexer (E)	82 out of 84 (98%)
	Second Indexer (S)	78 out of 84 (93%)
	Half and Half (E-S)	81 out of 84 (96%)
	Half and Half (S-E)	80 out of 84 (95%)
Justification Section	Experienced Indexer (E)	84 out of 84 (100%)
	Second Indexer (S)	84 out of 84 (100%)
	Half and Half (E-S)	84 out of 84 (100%)
	Half and Half (S-E)	84 out of 84 (100%)
GENERALIZATION CS's		
Evaluation Section	Experienced Indexer (E)	58 out of 60 (97%)
	Second Indexer (S)	58 out of 60 (97%)
	Half and Half (E-S)	58 out of 60 (97%)
	Half and Half (S-E)	58 out of 60 (97%)
Justification Section	Experienced Indexer (E)	60 out of 60 (100%)
	Second Indexer (S)	60 out of 60 (100%)
	Half and Half (E-S)	60 out of 60 (100%)
	Half and Half (S-E)	60 out of 60 (100%)
GENERALIZATION RM's		
Evaluation Section	Experienced Indexer (E)	131 out of 162 (81%)
	Second Indexer (S)	128 out of 162 (79%)
	Half and Half (E-S)	130 out of 162 (80%)
	Half and Half (S-E)	133 out of 162 (82%)
Justification Section	Experienced Indexer (E)	144 out of 162 (89%)
	Second Indexer (S)	141 out of 162 (87%)
	Half and Half (E-S)	148 out of 162 (91%)
	Half and Half (S-E)	140 out of 162 (86%)

expected to achieve as good classification results as either indexer indexing the entire data base alone. Therefore, there appears to be no necessity to use only one indexer for a particular data base in order to obtain optimum extraction of differentiating information. These conclusions are based on the premise that indexers are well trained to begin with and conscientious in applying the indexing rules and conventions to the best of their ability.

SECTION 5. EFFICIENCY OF THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE COMPARED TO THE ORIGINAL LENGTHY INDEXING PROCEDURE

Introduction

Although the rational condensation short-cut indexing procedure did not achieve the classification accuracy of the original lengthy indexing procedure which had more variables available for the stepwise discriminant analysis process, it did achieve an acceptable level of classification performance in comparison to the longer, more complex indexing methodology.[6] The rational condensation short-cut indexing procedure is much easier to apply and appears to be slightly more reliable since there are fewer areas of ambiguity, resulting in more consistent interpretation of the indexing rules and conventions. Therefore, an important consideration is how efficient each of these two indexing procedures is for indexing a particular sample of Evaluation Reports. This kind of comparison can provide data needed for assessing the economic feasibility of adding information extracted from narrative comments into a composite score for predicting an enlisted man's potential for assuming the managerial responsibilities of the next higher pay grade.

Methodology

A subsample of 12 Evaluation Reports taken from the E5-E6 fleet trial data base was selected, ranging from a report with a short narrative text on only the Evaluation Section (43 words - Case 406) to a report with very lengthy narrative comments on both sections (338 words - Case 717). The time required to apply the rational condensation short-cut indexing procedure and the original lengthy indexing procedure to this 12-case subsample was compared. Taken into account in the comparison was the time required by both indexing procedures (1) to index the narrative text for the Evaluation Section and the Justification Section, (2) to enter the resulting indexing decisions onto the indexing form, (3) to code the data recorded on the indexing forms onto IBM coding sheets, (4) to keypunch the IBM coding sheets, and (5) to keyverify the IBM coding sheets. The computer processing time required by each of the two indexing procedures also was considered.

Results

In comparing the efficiency of the two indexing procedures on the 12-case subsample described above, the Evaluation Section and the Justification Section were considered separately where possible. Table 33 shows the results for the Evaluation Section. In the application of both indexing methods, the total number of words contained in the narrative text must be counted, and the time to make this count is the same for both methods. For the Evaluation Section, the total number of words ranged from 36 to 195, with a mean of 80 words for the 12 cases. On the average it took 45-1/2 seconds to count the words in the narrative text of the Evaluation Section, or approximately three-quarters of a minute. The average time required to index the Evaluation Section for these 12 cases was approximately 5-1/2 minutes for the original

TABLE 33

EFFICIENCY OF THE ORIGINAL LENGTHY INDEXING PROCEDURE VS. THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE ON THE EVALUATION SECTION

Case No. (N=12)	Evaluation Section		ORIGINAL LENGTHY INDEXING PROCEDURE (Evaluation Section)				RAT. CONDENSATION SHORT-CUT PROCEDURE (Evaluation Section)			
	Total No. of Words	Word Count (in sec.)	Index Time (in min.)	Total No. of Terms	Index Form (in min.)	IBM Coding (in min.)	Index Time (in min.)	Total No. of Terms	Index Form (in min.)	IBM Coding (in min.)
117	64	33	3.50	8	2.25	2.50	1.50	10	1.50	0.75
123	36	20	4.00	5	2.00	2.25	1.50	5	1.00	0.75
125	77	45	4.50	11	2.25	2.50	3.00	11	1.75	1.00
129	40	20	4.50	5	2.00	2.00	3.75	5	1.00	0.75
131	77	42	2.25	9	2.75	2.50	2.25	10	1.50	0.75
133	63	31	4.75	7	2.00	2.50	2.00	8	1.50	0.75
137	76	45	6.00	7	2.75	3.00	3.00	11	1.75	1.00
141	76	50	4.75	6	2.50	2.50	3.25	8	1.50	1.00
143	78	45	3.50	6	2.25	2.50	2.50	7	1.50	1.00
309	135	75	11.00	14	2.75	2.50	8.00	15	2.25	1.00
406	43	20	2.50	5	1.75	2.50	1.75	7	1.50	1.00
717	195	120	14.50	23	4.75	2.50	9.00	27	3.25	1.00
Mean	80.0	45.5	5.48	8.8	2.50	2.48	3.46	10.3	1.67	0.90
S.D.	44.5	28.2	3.62	5.2	0.78	0.23	2.47	6.0	0.60	0.13

lengthy indexing procedure and approximately 3-1/2 minutes for the rational condensation short-cut indexing procedure. An average of 8.8 index terms were assigned using the lengthy procedure compared to an average of 10.3 index terms using the short-cut procedure. The reason that more index terms were applied in the short-cut procedure is that a greater degree of indexing exhaustivity is exercised, but since there is less room for ambiguity in interpreting the indexing rules and conventions for the rational condensation short-cut method, selection of index terms can be accomplished more speedily. Why there is less room for ambiguity is explained on page 50.

The average time required to enter the indexing decisions made on the Evaluation Section onto the indexing form was 2-1/2 minutes for the lengthy indexing procedure and 1-2/3 minutes for the short-cut indexing procedure. The time required to code the data recorded on the indexing form onto an IBM coding sheet is where the most significant time difference occurred between the two indexing procedures. For the Evaluation Section it required approximately 2-1/2 minutes on the average to perform the coding operation for the lengthy method compared to a little under 1 minute for the short-cut method. This result is not surprising since two punched cards utilizing a total of 149 columns comprise the coding format for the lengthy method whereas only 55 columns contained on one punched card comprise the coding format for the rational condensation short-cut method.

Table 34 presents the results for the Justification Section. The total number of words contained in the narrative text ranged from zero words (two cases had no justification comments) to 143 words, with a mean of 61.3 words for the 12 cases. On the average it took approximately 35 seconds to count the words in the narrative text of the Justification Section, or a little over half of a minute. The average time required to index the Justification Section for these 12 cases was a little over 5 minutes for the lengthy procedure and 3-1/2 minutes for the short-cut procedure. An average of 6.1 index terms were assigned using the lengthy procedure compared to an average of 6.8 index terms using the short-cut procedure.

The average time required to enter the indexing decisions made on the Justification Section onto the indexing form was 2 minutes for the lengthy indexing procedure and 1-1/3 minutes for the short-cut indexing procedure. The time required to code the data recorded on the indexing form onto an IBM coding sheet was a little over 2 minutes for the lengthy procedure compared to approximately three-quarters of a minute for the short-cut procedure.

t-tests of mean difference were computed for these four comparisons on both the Evaluation Section and the Justification Section. The results are reported in Table 35. Although it takes less time to index with the short-cut indexing procedure, this difference is not statistically significant on either the Evaluation Section or the Justification Section. However, in interpreting this result it should be borne in mind that besides the smallness of the subsample of Evaluation Reports used in this study (only 12 cases), the cases were selected to cover the full range of length of text. This latter characteristic of the subsample served to increase the variance, thus requiring a larger mean difference to achieve statistical significance. In actuality there is a consistent difference in the length of time needed to apply the two

TABLE 34

EFFICIENCY OF THE ORIGINAL LENGTHY INDEXING PROCEDURE VS. THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE ON THE JUSTIFICATION SECTION

Case No. (N=12)	Justification Section		ORIGINAL LENGTHY INDEXING PROCEDURE (Justification Section)				RAT. CONDENSATION SHORT-CUT PROCEDURE (Justification Section)			
	Total No. of Words	Word Count (in sec.)	Index Time (in min.)	Total No. of Terms	Index Form (in min.)	IBM Coding (in min.)	Index Time (in min.)	Total No. of Terms	Index Form (in min.)	IBM Coding (in min.)
117	26	15	4.50	3	1.50	2.25	2.00	4	1.00	0.75
123	20	12	2.00	3	1.25	2.00	0.75	3	0.75	0.75
125	50	25	4.75	7	2.00	2.25	2.25	8	1.50	0.75
129	66	35	1.75	2	1.50	1.75	1.25	2	0.75	0.75
131	119	65	6.50	9	2.25	2.25	5.50	10	1.75	0.75
133	0	0	0.00	0	1.00	1.25	0.00	0	0.50	0.50
137	92	45	6.50	10	2.75	2.75	5.75	11	1.75	0.75
141	49	25	5.25	6	2.50	2.75	2.50	7	1.50	0.75
143	61	30	5.00	7	2.50	2.50	5.50	10	1.75	0.75
309	110	75	9.50	11	2.75	2.25	7.00	12	2.00	0.75
406	0	0	0.00	0	0.75	1.50	0.00	0	0.50	0.50
717	143	90	16.00	15	3.25	2.25	9.50	15	2.25	1.00
Mean	61.3	34.8	5.15	6.1	2.00	2.15	3.50	6.8	1.33	0.73
S.D.	46.8	29.0	4.43	4.7	0.79	0.46	3.06	5.0	0.61	0.13

TABLE 35

RESULTS OF THE *t*-TESTS OF MEAN DIFFERENCE BETWEEN THE ORIGINAL LENGTHY INDEXING PROCEDURE AND THE RATIONAL CONDENSATION SHORT-CUT INDEXING PROCEDURE ON EFFICIENCY OF INDEXING

	Original Lengthy Indexing Procedure		Rational Condensation Short-Cut Procedure				
	Mean	Var.	Mean	Var.	*t*	*df*	Probability Level
Evaluation Section							
Index Time (in min.)	5.48	13.13	3.46	6.09	1.60	22	P>.05
Total No. of Terms	8.83	27.24	10.33	35.52	-0.66	22	P>.05
Index Form (in min.)	2.50	0.61	1.67	0.36	2.93	22	.001<P<.01
IBM Coding (in min.)	2.48	0.05	0.90	0.02	21.15	22	P<.001
Justification Section							
Index Time (in min.)	5.15	19.58	3.50	9.39	1.06	22	P>.05
Total No. of Terms	6.08	21.72	6.83	24.70	-0.38	22	P>.05
Index Form (in min.)	2.00	0.63	1.33	0.37	2.32	22	.02<P<.05
IBM Coding (in min.)	2.15	0.21	0.73	0.02	10.32	22	P<.001

indexing procedures, with the rational condensation short-cut procedure taking approximately two-thirds of the time required by the original lengthy procedure. Indexing time is the largest component of the total time required to apply a particular indexing procedure. Consequently, if indexing time can be reduced, then significant cost savings can be realized.

Table 35 also shows that although more index terms are assigned in the application of the short-cut procedure compared to the lengthy procedure, this difference is not statistically significant on either the Evaluation Section or the Justification Section. However, the average time required to enter the indexing decisions onto the indexing form was significantly less for the short-cut procedure on both sections of the Evaluation Report. On the Evaluation Section this difference was statistically significant between the .01 and .001 levels of probability; on the Justification Section this difference was statistically significant between the .05 and .02 levels of probability. The most pronounced difference statistically between the two indexing methods resulted in the t-tests of mean difference in the average time required to code the data recorded on the indexing form onto IBM coding sheets, with the short-cut procedure requiring significantly less time than the lengthy procedure. On both the Evaluation Section and the Justification Section this difference was statistically significant beyond the .001 level of probability.

The analysis of the keypunching and keyverifying of the IBM coding sheets pertaining to the 12-case subsample indexed by the lengthy and short-cut indexing procedures was carried out in the following manner. First, the time required for keypunching and keyverifying the Evaluation Section and the Justification Section could not be separated in the analysis since the cards pertaining to these two sections for a case are punched or verified sequentially, not separately. Second, if the machine operator had stopped to record the elapsed time for each case individually, it would have interrupted her keyboarding rhythm. It was not practical to have an observer attempt to clock the elapsed time for each case since the only clues to rely on are the release of a card from the punch position and the registration of the next card in the punch position, a sequence of operations that would be impossible to clock and record while also noting the beginning time of the next case. Therefore, the times required to keypunch and to keyverify the IBM coding sheets pertaining to the 12-case subsample were recorded in toto for each indexing method. These total times then were divided by 12 to arrive at the average keypunching and keyverifying time per case.

For the lengthy indexing procedure, on the average it required 61.4 seconds or a little over a minute to keypunch the two cards corresponding to each case compared to an average of 29 seconds or approximately half a minute to keypunch the single card for each case indexed by the rational condensation short-cut indexing procedure. The average time required to keyverify the two punched cards for a case indexed by the lengthy procedure was 53.7 seconds or a little under a minute compared to an average of 23 seconds to keyverify the single punched card for a case indexed by the short-cut procedure.

In an effort to arrive at some estimate of the comparative costs of applying the two indexing procedures to a typical 100-case sample of E5-E6 Evaluation Reports, Table 36 was prepared. The cost estimates in this table

TABLE 36

ESTIMATED COSTS OF CONTENT ANALYZING A 100-CASE SAMPLE OF E5-E6 EVALUATION REPORTS BY TWO INDEXING PROCEDURES PREPARATORY TO COMPUTER ANALYSIS

Steps in Content Analysis	ORIGINAL LENGTHY INDEXING PROCEDURE			RAT. CONDENSATION SHORT-CUT PROCEDURE		
	Estimated Time Required	Hourly Rate	Estimated Cost	Estimated Time Required	Hourly Rate	Estimated Cost
Index Decisions	1063 min. = 17.7 hrs.	$7.00	$123.90	696 min. = 11.6 hrs.	$7.00	$ 81.20
Index Form	450 min. = 7.5 hrs.	$4.00	$ 30.00	300 min. = 5.0 hrs.	$4.00	$ 20.00
IBM Coding	463 min. = 7.7 hrs.	$4.00	$ 30.80	163 min. = 2.7 hrs.	$4.00	$ 10.80
Key-punch	102.3 min. = 1.7 hrs.	$5.50	$ 9.35	48.3 min. = 0.8 hrs.	$5.50	$ 4.40
Key-verify	89.5 min. = 1.5 hrs.	$5.50	$ 8.25	38.3 min. = 0.6 hrs.	$5.50	$ 3.30
Total Estimated Cost			$202.30			$119.70

include all of the steps in the content analysis of the narrative text up to the point of computer analysis. The average time required by each step for the Evaluation Section and Justification Section combined was used as the base and multiplied by 100 in order to arrive at the estimated time required for a sample of 100 cases. Thus, it can be seen in Table 36 that an estimate of 17.7 hours is needed to index the narrative comments in both sections of 100 E5-E6 Evaluation Reports using the lengthy indexing procedure compared to 11.6 hours using the rational condensation short-cut indexing procedure. At an hourly rate of $7.00 for the indexer, the estimated indexing cost for the lengthy procedure amounts to $123.90 compared to $81.20 for the short-cut procedure.

Whatever hourly rates might be appropriate for the local situation can be substituted in this table in order to arrive at overall cost estimates for the two indexing procedures. The hourly rates that were used in arriving at the cost estimates are representative of the actual costs incurred in this research for the various steps in the content analysis. Probably the most informative cost estimate is the total estimated cost for applying each of the two indexing procedures to a 100-case sample of E5-E6 Evaluation Reports. For the original lengthy indexing procedure, the total estimated cost is $202.30 up to the point of computer analysis, or approximately $2.00 per case. For the rational condensation short-cut indexing procedure, the total estimated cost is $119.70, or approximately $1.20 per case. This cost comparison suggests that the rational condensation short-cut indexing procedure can be applied for about 60 percent of the cost of applying the lengthy indexing procedure to the same corpus of narrative text. Since little is lost in classification accuracy by using the short-cut indexing procedure, the economic advantage of this indexing method opts in its favor.

The only aspect of the comparative efficiency of these two indexing procedures that has not been considered thus far is the cost incurred by each procedure for the stepwise discriminant analysis. This cost primarily is a function of the size of the sample being analyzed and at how many steps in the process the computation of a classification matrix is specified. The entire data set must be scrutinized each time that the computation of a classification matrix is specified. The image of two punched cards per case (lengthy procedure) takes more time to scrutinize than the image of a single punched card per case (short-cut procedure). However, the computational costs are insignificant compared to the labor-intensive steps in the content analysis that are included in Table 36. Although computer costs would be dependent on the billing algorithm used by the computing facility at which the stepwise discriminant analysis was performed, a rough but probably reasonably accurate estimate is that the cost to perform a stepwise discriminant analysis of a particular 100-case sample would amount to approximately 2 to 3 percent of all of the labor costs incurred preparatory to computer analysis. The difference in cost in favor of the short-cut indexing procedure for the computer analysis is insignificant, amounting to only two or three dollars for a sample size of around 100 cases.

The overall conclusion that can be drawn from this study of the comparative efficiency of the two indexing procedures is that the rational condensation short-cut indexing procedure is more cost effective than the original

lengthy indexing procedure. The only justification for using the longer, more complex indexing methodology might be in situations where it was expected that discrimination between criterion groups would be extremely difficult to achieve, for example, selection of senior chief petty officers for advancement from Pay Grade E8 to Pay Grade E9 (Master Chief Petty Officer), where the candidates for promotion constitute a small, homogeneous group of highly qualified chiefs. The original lengthy indexing procedure has shown itself to yield slightly better classification accuracy than the rational condensation short-cut indexing procedure because it has more variables available for the stepwise discriminant analysis process.[6] In situations where discrimination is expected to be difficult, the original lengthy indexing procedure should be given serious consideration if the budget allows for its application. Otherwise, utilization of the rational condensation short-cut indexing procedure is recommended because it is substantially more cost effective and considerably easier and more comfortable for the indexer to apply.

SECTION 6. FURTHER AREAS OF INVESTIGATION

One final task remains to be done to complete this basic research project, namely, to perform a replication of the content analysis of the first E5-E6 fleet trial sample. Since six occupational specialties were represented in the first 300-case E5-E6 fleet trial sample, some of the subsample sizes for the six occupational groups are not as large as those for the four occupational specialties represented in the three E7 samples studied earlier. Consequently, the results of the stepwise discriminant analyses performed on the six occupational specialties represented in the first E5-E6 fleet trial sample should be regarded as suggestive rather than conclusive. Therefore, in this final task the number of cases in each occupational specialty will be doubled in order to accomplish two objectives: (1) to perform a replication of the analysis of the first 300-case E5-E6 sample on a second similar sample, and then (2) to combine the two E5-E6 samples into one large 600-case sample in order to provide more substantial subsample sizes for the analysis by occupational specialty. In addition, another occupational specialty---Hospital Corpsman (HM)---will be added to the replication sample, making a total of seven occupational specialties to be represented in the second E5-E6 fleet trial sample.

Table 37 summarizes the various subsamples that will have been analyzed at the conclusion of this basic research project. Exploitation of the substantive information contained in narrative performance evaluations for 1,328 enlisted men then will have been carried out across three pay grades for ten occupational specialties. Note that by doubling the original E5-E6 fleet trial sample, none of the ten occupational specialties will be represented by less than 60 cases. The results of the various stepwise discriminant analyses, therefore, should provide stable results for use by NPRDC in conducting subsequent applied research studies that include performance variables derived by the content analytic techniques developed in this basic research project.

It should be pointed out that the replication of the original study on the first E5-E6 fleet trial sample will provide a more stringent test of the rational condensation short-cut indexing procedure. In the original study of the first E5-E6 fleet trial sample, the individuals marked in the lower portion of the marking scale on Performance of Duty were eliminated from the sampling paradigm. The sample cases then were drawn from the remaining top portion of the marking scale so as to form three criterion groups---Upper, Middle, and Lower. Within this top portion the three criterion groups were selected to be as widely separated as possible, given the available cases from which to sample. In the replication of the original study on the first E5-E6 fleet trial sample, the three criterion groups by necessity will have to be much more contiguous on the criterion variable, Performance of Duty. Consequently, the ability of the stepwise discriminant analysis algorithm to correctly classify individuals into their appropriate criterion group using the quantitative variables derived from a content analysis of the narrative evaluation comments using the rational condensation short-cut indexing procedure will be much more severely tested than it was in the original E5-E6 study. Nevertheless, it is anticipated that the rational condensation short-cut indexing method will be robust enough to perform well even under these more challenging circumstances.

TABLE 37

SUMMARY OF THE VARIOUS SUBSAMPLES THAT WILL HAVE BEEN ANALYZED AT THE CONCLUSION OF THIS BASIC RESEARCH PROJECT

Occup. Spec.	*Pay Grades E5-E6*			*Pay Grade E7*			
	Fleet Trial Sample 1	Fleet Trial Sample 2	Sum	Pilot Study Sample	Cross Validation Sample	Sum	Generalization Sample
AT				144	138	282	
BT				80	84	164	
CS							60
RM	51	51	102				162
AD	45	45	90				
DC	30	30	60				
ET	69	69	138				
PN	66	66	132				
SK	39	39	78				
HM		60	60				
Total N	300	360	660	224	222	446	222

REFERENCES

1. Robertson, D. W. Source documents for the automated enlisted performance evaluation system. Research Memorandum SRM 72-10, March 1972, Naval Personnel and Training Research Laboratory, San Diego, California 92152.

2. Robertson, D. W., James, J., & Royle, Marjorie H. Feasibility of computer-generated data displays in the automated performance evaluation system. Research Report SRR 72-20, April 1972, Naval Personnel and Training Research Laboratory, San Diego, California 92152.

3. Robertson, D. W., Royle, Marjorie H., & James, J. Design and fleet trial of automated performance evaluation forms for two pay grade groups: E5-E6 and E1-E4. Research Report SRR 72-11, November 1972, Naval Personnel and Training Research Laboratory, San Diego, California 92152.

4. Ramsey-Klee, Diane M. A content analysis of the narrative sections of Navy performance evaluations for senior enlisted personnel. Technical Report No. 2-71, October 1971, R-K Research and System Design, Contract Nonr N00014-70-C-0291 - Project NR 153-316, Office of Naval Research. AD 734018.

5. Ramsey-Klee, Diane M., & Richman, Vivian. Cross validation and generalization of a content analysis of the narrative sections of Navy performance evaluations for senior enlisted personnel. Technical Report No. 1-73, April 1973, R-K Research and System Design, Contract Nonr N00014-72-C-0231 - Project NR 150-344, Office of Naval Research. AD 766515.

6. Ramsey-Klee, Diane M., & Richman, Vivian. Continuation studies of the exploitation of the narrative sections of Navy performance evaluations for senior enlisted personnel by means of content analytic techniques. Technical Report No. 3-74, June 1974, R-K Research and System Design, Contract Nonr N00014-72-C-0231 - Project NR 150-344, Office of Naval Research. AD 781727.

7. Koontz, H., & O'Donnell, C. *Principles of Management* (5th ed.). New York: McGraw-Hill Book Co., 1972.

8. Dixon, W. J. (Ed.). *BMD: Biomedical Computer Programs*. Los Angeles: University of California Press, 1973.

9. Cohen, J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 1960, *20*, 37-46.

10. Cohen, J. Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological Bulletin*, October 1968, *70*(4), 213-220.

11. Spitzer, R. L., Cohen, J., Fleiss, J. L., & Endicott, Jean. Quantification of agreement in psychiatric diagnosis: A new approach. *Archives of General Psychiatry*, July 1967, *17*, 83-87.

APPENDIX A

TRAINING MANUAL FOR INDEXING THE NARRATIVE SECTIONS OF NAVY PERFORMANCE EVALUATIONS FOR ENLISTED PERSONNEL

1974-1975

PURPOSE	100
BACKGROUND	100
THE MANAGEMENT PROCESS	101
ENLISTED PERSONNEL AS MANAGERS	102
QUANTIFYING THE INDEX TERMS	103
SPECIAL INDEXING CONSIDERATIONS	104
SUMMARY OF INDEXING RULES	107
REFERENCES	108
TABLES AND FIGURES	109
ALPHABETICAL DICTIONARY OF INDEX TERMS	116

PURPOSE

The purpose of this manual is to train nonresearchers in the content analysis technique developed in a personnel research study by R-K Research and System Design to analyze the narrative sections of Navy performance evaluations for naval enlisted personnel in Pay Grades E5, E6, E7, E8, and E9.[1] Pay Grades E5 (2nd Class Petty Officer), E6 (1st Class Petty Officer), E7 (Chief Petty Officer), E8 (Senior Chief Petty Officer), and E9 (Master Chief Petty Officer) are all petty officers in the U.S. Navy. The objective of this study was to provide personnel decisions makers (e.g., selection boards and detailers) with a standardized way of detecting valid and discriminating indicators of on-job performance in the narrative comments written by evaluators so that they might choose the most qualified candidates for promotion, assignment, or quality retention.

BACKGROUND

Evaluation marks are assigned to an individual on a number of items by the evaluator in a Performance Evaluation Report. The purpose of this evaluation is to compare the individual with all others of his rate known to the evaluator on specific aspects of on-job performance. The evaluation marks are used in making personnel decisions for re-enlistment, advancement, and awards. Two sections of the Performance Evaluation Report provide space for the evaluator to write narrative comments to describe further the individual's performance and qualifications. The two sections are an evaluation comments section and a justification comments section, the second of which is required to be filled in for individuals whose evaluation marks were at the high end of the marking scale.

The Evaluation Section and the Justification Section are referred to as the narrative text of the Performance Evaluation Report since they are the only portions of the report where the evaluator uses his own words to assess the on-job performance of the enlisted man that he is evaluating. Thus far the narrative Evaluation and Justification Sections of the Performance Evaluation Report have not been exploited systematically in making personnel decisions because narrative text tends to resist objective analysis and interpretation. However, results from previous content analysis studies of the narrative text strongly suggest that there are stable differences among petty officers in their performance characteristics that are reflected in the narrative statements written about them by evaluators.[1,2,3] Furthermore, these differences are both identifiable and quantifiable. The remainder of this manual presents a set of explicit and detailed guidelines for identifying, indexing or labeling, and quantifying (by means of a weighting scale) the concepts and ideas represented in the narrative text of Navy performance evaluations for enlisted personnel. These quantified labels have been shown to discriminate or differentiate between superior enlisted personnel and their slightly less qualified colleagues.

THE MANAGEMENT PROCESS

The operations of a manager may differ from one organization or from one institutional setting to another; however, the functions of a manager are common to all. The task of the manager is one of selecting goals and designing and maintaining an environment that makes possible the performance of individuals working together in a group to attain these goals. An example of the managerial process in operation can be illustrated by the task of finding a suitable home in which to live. The goal selected is to find a home for X amount of dollars within a certain geographic area. After using the available resources, such as real estate agents and newspaper ads, it becomes evident that the only way in which to attain the goal is to build a house. The selection of this alternative and how to implement it is all part of the *planning* process. Information must be gathered, decisions must be made on the basis of this information, and the means for accomplishing the goal must be decided upon. The budget then is specified and allocated. Y amount of dollars will be spent on the lot and Z amount on the house construction. Other decisions that must be made are how large the house should be, what style it should take, what materials should be used considering the budget constraints and the style of the house, how long the building stage should take in order to meet the needs of the new occupants and still be a realistic compromise with their expectations, how many people are needed to implement each stage of the plan, what their backgrounds should be, and so on. Once the plan is established, it is necessary to ensure that the plan is carried out so that the goal set is reached. This is accomplished by the *controlling* function. Performance of the tasks involved must be measured constantly against the plan, and the correction or prevention of deviations from the plan must be monitored continuously. Through the accounting system, it may be discovered that too much of the budget was spent at one stage of building so that cuts must be made at another stage to bring the budget back into line with planned expenditures. The time spent on grading the lot may have taken longer than planned and time-saving devices may be employed at a later stage of building to adhere to the plan. Or the plan may have to be altered and a later date to move into the new house may have to be established, thus causing an alteration of related factors such as extending the lease for the house being rented on a temporary basis until the new house is ready for occupancy. *Controlling* takes place throughout the entire building process, correcting deviations and preventing deviations from the plan in order to meet the established goal.

The construction has to be organized, a task which involves the *organization* function. The number of activities are enumerated, such as designing, contracting, and subcontracting. Authority relationships are established. The designer and the general contractor report directly to the owner; the subcontractors (framers, carpenters, plasterers, painters, etc.) report to the general contractor; and the designer and contractor confer with each other on an equal authority basis under the owner's supervision. All these roles and their interrelationships are part of the organization structure. The *staffing* function concerns manning the roles or activities that have been enumerated in the organization structure. Individuals are appraised, selected, and hired. A designer is selected to perform the designing activity instead of an architect since it was decided during the planning stage that designers are less expensive on the cost side and not much is lost on the benefit side. If some

individuals have to be trained on the job, this is all part of *staffing*, that is, keeping manned the roles as specified on the organization chart. Once the positions are manned, constant *controlling* or monitoring is needed to ensure that the jobs are being performed as planned.

The *leadership and directing* function is performed by the owner and also by the general contractor when the subordinates or subcontractors are motivated, guided, and supervised in accomplishing a task and working towards improved performance. The designer may also have a staff that needs to be led and directed. Subordinates are encouraged to work together harmoniously and in an effective and efficient manner with the aim of achieving the primary goal. Through the performance of these basic managerial functions, the main goal of having a suitable house in which to live is achieved.

For certain organizations there is one other management function of significant note---*representation*. This function refers to the creation of an image of an organization to the external or internal environment. The Navy is a service organization, and how it is viewed by the public can influence its funding by the Congress. How the institution looks to the outside world is more important for the Navy than for a private corporation. Also, in order to attract recruits, their image is very important.

ENLISTED PERSONNEL AS MANAGERS

Enlisted personnel in Pay Grades E5, E6, E7, E8, and E9 are all managers in the sense that they all are responsible for the supervision of other enlisted men whose work they direct. Therefore, the unifying focus in this manual is on the assessment of a petty officer as a manager. Petty officers in these pay grades are junior level managers, and as such, they must perform technical as well as managerial functions.

Table A-1 shows a hierarchy of 15 index terms or descriptive labels that can be used to characterize the on-job managerial performance of petty officers. These index terms are the terms to be mapped onto the narrative text to give it objective structure and to systematize the way that this text is analyzed and interpreted. Note in Table A-1 that the 15 index terms are divided into three sections. The first section contains four terms which represent seven MANAGEMENT FUNCTIONS that many authorities on management practice agree are the characteristic duties of all managers.[5,6,7,8] Although some authorities believe that there are more, less, or different functions performed by managers, these seven functions (condensed into four terms) were selected because they are representative of the duties that petty officers actually perform.

The second section of Table A-1 contains seven index terms for different types of SKILLS AND ABILITIES considered to be important by Navy supervisory personnel in performing effectively as a petty officer. While some authorities on management practice consider making a judgment about whether or not an individual possesses a skill, quality, or ability to be a subjective process, Navy evaluators do repeatedly call out these specific qualities in their narrative evaluations because many of these qualities are dimensions on which the evaluator assigns evaluation marks to an individual in the Performance Evaluation

Report. The first section of Table A-1---MANAGEMENT FUNCTIONS---deals with how a ratee performs his managerial functions and is result oriented, while the second section---SKILLS AND ABILITIES---contains index terms that relate to an individual's characteristics and qualities which, if used, may help him achieve good results. Subsumed under CONDUCT AND ATTITUDE are the more specific types of conducts and attitudes COOPERATION AND RESPONSIVENESS and ENDURANCE AND MOTIVATION which often are identified specifically in the Evaluation Reports.

The third section of Table A-1---PRODUCTIVITY AND ACHIEVEMENT---is also a result-oriented section of the hierarchy. Here are included the measures of overall performance. Subsumed under PRODUCTIVITY AND ACHIEVEMENT is RECOGNITION which represents the acknowledgment of an individual's performance.

QUANTIFYING THE INDEX TERMS

It is not enough to simply label a narrative statement with the most appropriate index term since the statement may have been a highly positive, quite positive, neutral, quite negative, or highly negative one. For example, in order to differentiate between the individual who plans superbly and the individual who plans inadequately, a weighting scale was devised to be applied to each index term that is used (see Table A-2). The weighting scale contains five numerical values ranging from 3, the positive end of the scale, to -2, the negative end of the scale.* Under each numerical value in Table A-2 there are listed examples of descriptive words or phrases that may be used by the evaluator to describe an individual's performance. These lists of words provide clues to the indexer as to which numerical value to assign to an index term. As a simple example, if the evaluator commented that an individual was "highly cooperative," this statement would be indexed as COOPERATION AND RESPONSIVENESS and assigned a weight of 2 since *highly* is listed as an example under numeral 2 in Table A-2.

However, when a qualifier is not present on the weighting scale, the indexer will have to exercise his own judgment. An important tool to use for making weighting decisions is a dictionary. For example, the words *constantly* or *absolute* may be used as qualifiers. Synonyms for the word *constantly* are *always, all the time, repeatedly,* and *very often. Very* and *always* are listed on the weighting scale as 2 weights; therefore, a 2 weight would be the logical choice for the qualifier *constantly*. There are several meanings for *absolute* such as *perfect, complete, whole, pure, positive, certain,* and *definite. An important consideration for the indexer to keep in mind is the context in which the qualifier has appeared.* In the phrase "absolute loyalty," the indexer has to decide which synonym best suits *absolute* by trying to understand the meaning of the qualifier in relationship to its surrounding text. In this case, the

---

* If certain index terms are not used at all in indexing the Evaluation Section narrative or the Justification Section narrative, they are given a value of zero on the weighting scale. Zero weight which represents no comment is placed between the positive comments (3 weights, 2 weights, and 1 weights) and the negative comments (-1 weights, and -2 weights). However, the indexer should ignore the zero value for indexing purposes since it only becomes important when the indexing decisions are recorded on the indexing forms.

evaluator seems to be saying that the individual is "completely loyal," so *complete* would be considered to be the appropriate synonym for *absolute*. Since *complete* is a 2 weight, *absolute* would be assigned a 2 weight. In situations where synonyms fall under different weights it is useful to ask, "Could this statement have been phrased in another way by the evaluator that would have made it a stronger or a weaker statement?" The evaluator could have said "maximum loyalty" or "superb loyalty" which then would have warranted a 3 weight.

The comparative qualifiers can be used in either a positive or negative connotation depending on the surrounding context of the text. For example, "He is very trustworthy," would be indexed as CONDUCT AND ATTITUDE 2 because *very* falls under the 2 weights on the weighting scale. However, if the context of the text was a negative one, "He is very untrustworthy," then the weight would fall in the same place on the negative side of the scale and the label CONDUCT AND ATTITUDE -1 would be used. Note that an award or a punishment is given either a 3 or a -2 weight with the index term RECOGNITION since there is no degree of variance. Either the individual was given an award or not, or was punished (disciplined) or not.

SPECIAL INDEXING CONSIDERATIONS

An alphabetical dictionary of the 15 index terms appears at the end of this discussion. For each term in the dictionary, a definition is given, examples of narrative text indexed with the term are cited, and usage rules to guide the indexer in choosing this term or another term are supplied. Careful study of the dictionary will instruct the new indexer in how index terms and their numerical weights should be assigned in order to ensure a systematic and objective application of the indexing procedures explained in this manual. Although some indexing examples may not always seem logical to the new indexer, each indexing decision has been meticulously and thoroughly considered. The examples presented in the alphabetic dictionary represent a distillation of three years of indexing experience and constitute a self-instructional compilation of crucial indexing rules and conventions that the new indexer needs to know in depth in order to be able to index the narrative text of Performance Evaluation Reports accurately and consistently. Even after carefully studying the manual, the indexer should refer constantly to the manual while in the process of indexing. Figure A-1 presents an example of the indexed narrative sections of a Performance Evaluation Report.

There are several indexing considerations that should be kept in mind as they will assist the indexer in maintaining consistency and will help resolve indexing dilemmas. It must be remembered that concepts or ideas are being indexed and not words alone. There are two basic approaches to indexing. One approach is more mechanical and the indexing is done by use of a key word approach. The second approach is intellectual and the indexing is done with a conceptual approach. *This manual illustrates the latter conceptual indexing approach so that concepts are indexed and not key words.* For example in the key word approach, "He knows how to *manage* his men," would be indexed as MANAGEMENT FUNCTIONS because of the word "manage" when the concept that actually is being conveyed is that the individual is proficient at LEADERSHIP AND DIRECTING. Also the following phrases would be indexed incorrectly and not

really be the concept that the evaluator is trying to convey if only the key word or the incorrect key word was picked up. "*Ability* to plan" should be indexed as PLANNING-CONTROLLING and not SKILLS AND ABILITIES. "Understands the *communications* system" should be indexed as PROFESSIONAL AND TECHNICAL SKILLS and not COMMUNICATION. "He needs no *supervision*" should be indexed as CONDUCT AND ATTITUDE and not MANAGEMENT FUNCTIONS for the word "supervision."

Another consideration to keep in mind is that when a description of a job or job duties is included in the narrative text, this description is not indexed since it is a factual statement describing the qualifications needed to perform a specific job or the duties of that job. Therefore, the statement is about the job itself and not about the individual being evaluated. Even if such a statement is modified by adjectives or adverbs, it still is not indexed if it refers to how a job should be performed and not to how the individual actually performs a job. As an illustration of this convention, if planning is mentioned as one of the individual's duties, and it is mentioned in the context of a factual statement as opposed to a statement of evaluation or accomplishment, then no index term would be assigned to this statement. For example, "Chief XX is required to develop procedural methods of accomplishing the division workload." Even if an adjective or adverb is added to this statement--- "Chief XX is required to develop effective and efficient procedural methods of accomplishing the division workload," the statement is still about a specific job duty or requirement and the modifiers refer to how the job should be performed. The modifiers do not refer to the individual per se and, therefore, this statement should not be indexed since it is not evaluating the individual. However, if a statement is a qualitative statement and refers to the individual, then it becomes a statement of evaluation and is indexed. If the evaluator said that the individual plans well on the job, then a value judgment has been rendered about what kind of a planner the individual is. For example, "Chief XX has developed effective and efficient procedural methods of accomplishing the division workload;" this statement would be labeled PLANNING-CONTROLLING 1. The statement no longer is a factual one but has become an evaluative comment about the individual rather than a statement describing a job requirement. "Chief XX has developed procedural methods of accomplishing the division workload," would be labeled PLANNING-CONTROLLING 1 since the evaluator thought it worthwhile to mention this information and the statement, therefore, evaluates the individual although no modifying adjective or adverb was used. *Always keep in mind that indexing decisions are made in terms of the qualifications that an individual actually possesses that can aid him in performing a job, in terms of how a job is performed by an individual, or in terms of the results achieved.*

Also keep in mind that in deciding on which numerical weight to use, *modifying adjectives and/or adverbs must be associated with the idea or concept being indexed and not with another idea or concept in the same sentence.* Each statement indexed has to be regarded as a separate entity lest confusion and inconsistency result. For example, consider the following statement: "His resourcefulness in completing his tasks in the most efficient and thorough manner is noted." *Most* is associated with the manner in which the individual performs his tasks and, therefore, qualifies PRODUCTIVITY AND ACHIEVEMENT as a 3. The individual's resourcefulness is not modified but it is stated that he possesses that characteristic. It helped to make the 3 weight possible for PRODUCTIVITY AND ACHIEVEMENT, but the first part of the statement is only indexed as SKILLS AND ABILITIES 1. To be given a 3 weight, the statement would have had to have

been, "His outstanding resourcefulness in completing his tasks in the most efficient and thorough manner is noted." To further illustrate this rule, "His congeniality contributes significantly to good morale among his subordinates" would be indexed as CONDUCT AND ATTITUDE 1 and LEADERSHIP AND DIRECTING 2 since *significantly* is associated with the contribution made to his subordinates' morale, which is a leadership function. When there is no modifier given for an evaluative statement, a 1 weight is assigned to the index term selected (e.g., "His planning efforts have led to..." would be labeled PLANNING-CONTROLLING 1). Also, if a modifying adjective or adverb that falls at the 1 position on the weighting scale is included in the evaluative statement, the index term selected still would be given a weight of 1 (e.g., "His competent planning has led to..." would also be labeled PLANNING-CONTROLLING 1).

However, *if an adjective occurs before a string of words and phrases, this adjective modifies each word or phrase in the string until there is a clear break in the sentence structure, or until the adjective could not logically and/or grammatically be associated with a particular word or phrase.* Only occasionally an adjective occurring before a string of words or phrases cannot logically and/or grammatically be associated with the string. For example, "excellent career motivated corpsman," would be indexed as ENDURANCE AND MOTIVATION 1 and PROFESSIONAL AND TECHNICAL SKILLS 3. "Excellent" does not logically or grammatically describe "career motivated," but is logically associated with what type of corpsman the individual is. However, in most cases an adjective occurring before a string of words and phrases does modify each word or phrase in the string. For example, "His outstanding technical knowledge and organizational ability have contributed to..." would be indexed as PROFESSIONAL AND TECHNICAL SKILLS 3 and ORGANIZATION AND STAFFING 3. The adjective *outstanding* modifies both phrases. Note that organization in the above example is referred to as a skill; yet it is placed under MANAGEMENT FUNCTIONS in the hierarchy of index terms. It is often difficult to differentiate between the performance of a function and the function as an actual skill that an individual may possess. For example, there is a definite ability to lead or skill of leadership; yet it also is a very important function performed by managers. These subtleties in word meaning and usage are part of the expressive fabric of the English language and continue to plague those who strive to achieve precision in systematizing the information content of written discourse. It is for this reason that indexing concepts and not key words is preferred. At some point arbitrary rules have to be imposed. In this content analysis scheme, the skill in performing a specific function or the skill in overall performance would be indexed by the index term for that specific function or performance.

Sometimes several words or phrases describe or qualify a specific concept and these several qualifiers may be of different weight values. For example, "He performs all tasks in a superior and very reliable manner." "Superior" is a 3-weight word, whereas "very" is a 2-weight word, but yet they both qualify the individual's performance. The rule here is to choose the highest weight which always takes priority when a specific concept is mentioned only once and hence is only labeled once. Therefore, the above sentence would be indexed as PRODUCTIVITY AND ACHIEVEMENT 3.

Every attempt has been made to present the information contained in this manual in as explicit and lucid a form as possible. However, indexing remains more of an art than a science for all of the reasons alluded to previously.

As an indexer you will encounter segments of narrative text for which only your considered judgment can help you arrive at the final decision. It is important, though, that you try to keep your judgments as consistent as possible. The best way to assure consistency is to keep records of difficult or marginal decisions and, if possible, of the basis on which these decisions were made. Table A-3 presents a glossary of indexing decisions that were made by one experienced indexer to handle the appearance of ambiguous or troublesome words and phrases in narrative text. Use this table as an extra indexing guide.

It is recommended that the new indexer become thoroughly familiar with this training manual before attempting to index the narrative sections of Performance Evaluation Reports. If one can compare one's independent trial indexing decisions with those of an experienced indexer, this procedure will serve to pinpoint areas of confusion in one's understanding of the indexing rules and conventions. Frequent rereading of, and reference to, the manual will help to guarantee that the rules are applied the same way from day to day.

SUMMARY OF INDEXING RULES

1. When a qualifier is not present on the weighting scale and a dictionary has to be used to find synonyms which are present on the weighting scale, the indexer has to keep in mind the context in which the qualifier has appeared.

2. Concepts are being indexed and not key words.

3. Indexing decisions are made in terms of the qualifications that an individual actually possesses that can aid him in performing a job, in terms of how a job is performed by an individual, or in terms of the results achieved. Factual statements such as those describing the qualifications needed to perform a specific job or the duties of that job are not indexed.

4. In deciding on which numerical weight to use, modifying adjectives and/or adverbs must be associated with the idea or concept being indexed and not with another idea or concept in the same sentence.

5. If an adjective occurs before a string of words and phrases, this adjective modifies each word or phrase in the string until there is a clear break in the sentence structure, or until the adjective could not logically and/or grammatically be associated with a particular word or phrase.

6. When a single concept is modified by two or more qualifiers, the highest weight for the qualifiers takes priority and is assigned to the specific label for that concept.

REFERENCES

1. Ramsey-Klee, Diane M., & Richman, Vivian. Continuation studies of the exploitation of the narrative sections of Navy performance evaluations of senior enlisted personnel by means of content analytic techniques. Technical Report No. 3-74, June 1974, R-K Research and System Design, Contract Nonr N00014-72-C-0231 - Project NR 150-344, Office of Naval Research. AD 781727.

2. Ramsey-Klee, Diane M., & Richman, Vivian. Cross validation and generalization of a content analysis of the narrative sections of Navy performance evaluations for senior enlisted personnel. Technical Report No. 1-73, April 1973, R-K Research and System Design, Contract Nonr N00014-72-C-0231 - Project NR 150-344, Office of Naval Research. AD 766515.

3. Ramsey-Klee, Diane M. A content analysis of the narrative sections of Navy performance evaluations for senior enlisted personnel. Technical Report No. 2-71, October 1971, R-K Research and System Design, Contract Nonr N00014-70-C-0291 - Project NR 153-316, Office of Naval Research. AD 734018.

4. Robertson, D. W., Royle, Marjorie H., & James, J. Design and fleet trial of automated performance evaluation forms for two pay grade groups: E5-E6 and E1-E4. Research Report SRR 72-11, November 1972, Naval Personnel and Training Research Laboratory, San Diego, California 92152.

5. Richman, B. M., & Farmer, R. N. *Management and Organizations*. New York: Random House, 1975.

6. Koontz, H., & O'Donnell, C. *Principles of Management* (5th ed.). New York: McGraw-Hill Book Co., 1972.

7. Koontz, H. *Appraising Managers As Managers*. New York: McGraw-Hill Book Co., 1971.

8. Newman, W. H., Summer, C. E., Jr., & Warren, E. K. *The Process of Management* (2nd ed.). Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967.

TABLE A-1

HIERARCHY OF INDEX TERMS

	Indexing Abbreviation
MANAGEMENT FUNCTIONS	*M F*
LEADERSHIP AND DIRECTING	*L&D*
ORGANIZATION AND STAFFING	*O&S*
PLANNING-CONTROLLING	*P-C*
REPRESENTATION	*REP*
SKILLS AND ABILITIES	*S&A*
COMMUNICATION	*COMM*
CONDUCT AND ATTITUDE	*COND & ATT*
COOPERATION AND RESPONSIVENESS	*COOP & RESP*
ENDURANCE AND MOTIVATION	*E&M*
CREATIVITY AND INITIATIVE	*CREAT & INIT*
INTELLECTUAL FUNCTIONING	*INT F*
PROFESSIONAL AND TECHNICAL SKILLS	*PROF & TS*
PRODUCTIVITY AND ACHIEVEMENT	*P&A*
RECOGNITION	*REC*

TABLE A-2

WEIGHTING SCALE

3 superlative best		2 comparative better than most	
above reproach	unquestioned	above average	model
awesome	utmost	admirable	much
beyond reproach	without equal	always	noteworthy
boundless	without exception	amazing	particularly
excellent	100%	better	prime
exceptional		broad	profound
extraordinary		completely	rare
extremely		considerable	remarkable
far surpassed		consistently	significantly
finest		continuously	strongly
flawless		deep	surpassed
greatest		distinguished	totally
highest		eloquent	tremendous
ideal		eminent	tribute
immeasurable		epitome	truly
infinite		especially	uncommonly
leave nothing to be desired		exceeds	unfaltering
less than 1% error		excels	unstinting
limitless		exemplary	unusual
maximum		expert	valuable
most		expertise	vast
never		extensive	very
outstanding		fine	wide
paramount		frequently	
peak		fully	
perfect		great	
sterling		high/highly	
superb		immaculate	
superior		immensely	
surpassed by none		impeccable	
top/topnotch		impressive	
top 10%		inspires	
uncomparable		intense	
unequalled		invaluable	
unimpeachable		invariably	
unique		laudable	
unlimited		leading	
unmatched		little to be desired	
		many	
		marked	
		meritorious	
		meticulously	

(Continued)

TABLE A-2 (CONT.)

WEIGHTING SCALE

1 norm typical		-1 comparative not as good as most	-2 superlative worst
accurately	quickly	below	bottom
adept	rapidly	declining quality	extremely low
adequate	readily	deficiency	least
aptly	satisfactory	degrades	lowest
asset	several	detrimental	major flaw
capable	skilled	difficulty	maximum (negative)
clearly	skillful	fair	minimum (negative)
commendable	smoothly	handicapped	poorest
competent	solid	in need of	worst
concisely	successfully	inability	
correctly	sufficiently	inexperience	
decidedly	thorough	insufficient	
definitely	tidy	lack of	
desirable	timely	lax	
easily	typical	limited	
effective	usually	loss of	
efficient	virtually	lower than average	
emulate	well	lowering of	
enviable	willingly	needs to improve	
expedient		negatively	
expeditious		neglective	
experienced		poor	
favorable		problem	
generally		reluctant	
genuine		shortcomings	
good		slow	
improved		spotty	
innate		suffers from	
instills		superficial	
keen		unable	
know-how		unfortunate	
logically		unwisely	
measurable		weak in	
moderate		with the exception of	
neat			
obviously			
of note			
often			
personal			
professional			
proficient			
promotes			
promptly			

EVALUATION COMMENTS

[In the performance of his duties, XX must deal with civilians from the technician level to the management level in order to obtain the information necessary to keep his project officer updated on the A-3 program.] His ability to converse easily and to put his point across has made him extremely effective in this position. He has continually put forth the extra effort necessary to be one of the better informed persons on the A-3 program. Due in part to his efforts the A-3 program is now running closer to on-schedule than it has for a long time.

JUSTIFICATION COMMENTS

XX shows superior traits of flexibility [in that his assigned duties have nothing to do with his rating as an ADR.] [Nevertheless, he has assumed the responsibilities of these duties] and performed them in an outstanding manner. [He has worked for different project officers and with numerous different civilians.] XX has done this to a large extent on his own, and by digging into various problems that have come up, he has been a most valuable assistant to his project officer.

LEGEND:

COMM	=	COMMUNICATION
COND & ATT	=	CONDUCT AND ATTITUDE
E&M	=	ENDURANCE AND MOTIVATION
P&A	=	PRODUCTIVITY AND ACHIEVEMENT
P-C	=	PLANNING-CONTROLLING
PROF & TS	=	PROFESSIONAL AND TECHNICAL SKILLS
REC	=	RECOGNITION
[ ]		denotes factual text not subject to indexing

Figure A-1. Example of an Evaluation Report Indexed by the Short-Cut Rational Condensation Method.

TABLE A-3

GLOSSARY OF WORD CLUES TO THE USE OF INDEX TERMS

Acts with ease = CONDUCT AND ATTITUDE 1
Adaptable = CONDUCT AND ATTITUDE 1
Adjustable = CONDUCT AND ATTITUDE 1
Administrator = MANAGEMENT FUNCTIONS 1
Admiration = RECOGNITION 1
Affable = CONDUCT AND ATTITUDE 1
Aggressive = ENDURANCE AND MOTIVATION 1
Agreeable = CONDUCT AND ATTITUDE 1
Alert (except when used to qualify another term) = INTELLECTUAL FUNCTIONING 1
Amiable = CONDUCT AND ATTITUDE 1
Appraisal of personnel = ORGANIZATION AND STAFFING 1
Assessment of personnel = ORGANIZATION AND STAFFING 1
Asset - If the ratee is considered to be the asset to the service, then use RECOGNITION. However, if one of his traits or skills is an asset to the Navy or in performing a task, then use "asset" as a qualifier for the trait or skill.
Assiduous = ENDURANCE AND MOTIVATION 1
Astute = INTELLECTUAL FUNCTIONING 1
Attention to detail = SKILLS AND ABILITIES 1
Attentive = CONDUCT AND ATTITUDE 1
Attentive to duty = ENDURANCE AND MOTIVATION 1
Background in rate = PROFESSIONAL AND TECHNICAL SKILLS 1
Bearing = CONDUCT AND ATTITUDE 1
Can-do attitude = ENDURANCE AND MOTIVATION 1
Common sense = INTELLECTUAL FUNCTIONING 1
Congenial = CONDUCT AND ATTITUDE 1
Constant = CONDUCT AND ATTITUDE 1
Coordinate = ORGANIZATION AND STAFFING 1
Decision making = PLANNING-CONTROLLING 1
Decisive = CONDUCT AND ATTITUDE 1
Delegate = ORGANIZATION AND STAFFING 1
Deliberate = CONDUCT AND ATTITUDE 1
Demeanor = CONDUCT AND ATTITUDE 1
Deportment = CONDUCT AND ATTITUDE 1
Devoted = ENDURANCE AND MOTIVATION 1
Diligent = ENDURANCE AND MOTIVATION 1
Directing - in reference to overall managerial functions or tasks = MANAGEMENT FUNCTIONS 1
- in reference to directing men = LEADERSHIP AND DIRECTING 1
Disposition = CONDUCT AND ATTITUDE 1
Dynamic = ENDURANCE AND MOTIVATION 1
Eager = ENDURANCE AND MOTIVATION 1
Earnest = CONDUCT AND ATTITUDE 1
Endeavor = ENDURANCE AND MOTIVATION 1
Example or sets an example = CONDUCT AND ATTITUDE 1
EXCEPT: leads by example = LEADERSHIP AND DIRECTING 1

(Continued)

TABLE A-3 (CONT.)

GLOSSARY OF WORD CLUES TO THE USE OF INDEX TERMS

Expertise = PROFESSIONAL AND TECHNICAL SKILLS 2
Flexible = CONDUCT AND ATTITUDE 1
Forceful = ENDURANCE AND MOTIVATION 1
Forcefulness of expression = COMMUNICATION 1
Foresight = CONDUCT AND ATTITUDE 1
Friendly = CONDUCT AND ATTITUDE 1
Genial = CONDUCT AND ATTITUDE 1
Helpful = CONDUCT AND ATTITUDE 1
Humor and good humored = CONDUCT AND ATTITUDE 1
Imagination = CREATIVITY AND INITIATIVE 1
Ingenuity = CREATIVITY AND INITIATIVE 1
Innovative = CREATIVITY AND INITIATIVE 1
Insight = INTELLECTUAL FUNCTIONING 1
Instituted = CREATIVITY AND INITIATIVE 1
Inventive = CREATIVITY AND INITIATIVE 1
Inventory = PLANNING-CONTROLLING 1
Job Titles are not indexed per se. However, if they qualify the adjective preceding them, they should be considered as giving additional information. This happens when the text describes a skill or knowledge in a specific role, such as Radioman or Instructor. (Chief Petty Officer is not a specific role.) If we have a label for the specific role, then we would label it accordingly. For example, leader = LEADERSHIP AND DIRECTING. Instructor includes more than the skill of communicating. It also includes skill with students, disciplining, and organizing material. Therefore:
Professional Chief Petty Officer (CPO) = PROFESSIONAL AND TECHNICAL SKILLS 1
Proficient CPO = SKILLS AND ABILITIES 1
Skilled CPO = SKILLS AND ABILITIES 1
Knowledgeable CPO = PROFESSIONAL AND TECHNICAL SKILLS 1
Outstanding man = SKILLS AND ABILITIES 1
Forceful Instructor = ENDURANCE AND MOTIVATION 1
Knowledgeable Instructor = PROFESSIONAL AND TECHNICAL SKILLS 1
Skilled Instructor = PROFESSIONAL AND TECHNICAL SKILLS 1
Skilled Radioman = PROFESSIONAL AND TECHNICAL SKILLS 1
Knowledgeable Radioman = PROFESSIONAL AND TECHNICAL SKILLS 1
Outstanding Personnelman = PROFESSIONAL AND TECHNICAL SKILLS 1
Knowledgeable manager = MANAGEMENT FUNCTIONS 1
Skilled manager = MANAGEMENT FUNCTIONS 1
Aggressive supervisor = ENDURANCE AND MOTIVATION 1
MANAGEMENT FUNCTIONS 1
Professional administrator = MANAGEMENT FUNCTIONS 1
Forceful leader = ENDURANCE AND MOTIVATION 1
LEADERSHIP AND DIRECTING 1
Knowledgeable leader = LEADERSHIP AND DIRECTING 1
Judgment = PLANNING-CONTROLLING 1
Keen mind = INTELLECTUAL FUNCTIONING 1

(Continued)

TABLE A-3 (CONT.)

GLOSSARY OF WORD CLUES TO THE USE OF INDEX TERMS

Logical mind = INTELLECTUAL FUNCTIONING 1
Loyal to the command (service, Navy) = ENDURANCE AND MOTIVATION 1
Loyalty = CONDUCT AND ATTITUDE 1
Making suggestions = CREATIVITY AND INITIATIVE 1
Methodical = SKILLS AND ABILITIES 1
Neat = CONDUCT AND ATTITUDE 1
New (something new developed by ratee) = CREATIVITY AND INITIATIVE 1
Open minded = CONDUCT AND ATTITUDE 1
Originating ideas = CREATIVITY AND INITIATIVE 1
Overcomes obstacles = ENDURANCE AND MOTIVATION 1
Perfectionist = CONDUCT AND ATTITUDE 1
Perseverance = ENDURANCE AND MOTIVATION 1
Potential (referring to a general capability) = SKILLS AND ABILITIES 1
Problem solving = PLANNING-CONTROLLING 1
Quiet = CONDUCT AND ATTITUDE 1
Recommendation for advancement = RECOGNITION 1
Recommended changes = CREATIVITY AND INITIATIVE 1
Resourcefulness = SKILLS AND ABILITIES 1
Respect = RECOGNITION 1
Sincere = CONDUCT AND ATTITUDE 1
Stable = CONDUCT AND ATTITUDE 1
Suggestion making = CREATIVITY AND INITIATIVE 1
Supervising - in reference to overall managerial functions or tasks = MANAGEMENT FUNCTIONS 1
- in reference to the supervising of men alone = LEADERSHIP AND DIRECTING 1
Supervising men = LEADERSHIP AND DIRECTING 1
Supervising tasks = MANAGEMENT FUNCTIONS 1
Supervisor = MANAGEMENT FUNCTIONS 1
Tactful (used alone) = CONDUCT AND ATTITUDE 1
Tactful with his men or subordinates = LEADERSHIP AND DIRECTING 1
Talent = SKILLS AND ABILITIES 1
Tidy = CONDUCT AND ATTITUDE 1
Traffic flow pattern = PLANNING-CONTROLLING 1
Trouble shooting (not of a technical nature) = PLANNING-CONTROLLING 1
Understands (a role or policy) = PROFESSIONAL AND TECHNICAL SKILLS 1
Versatile = SKILLS AND ABILITIES 1
Vigor = ENDURANCE AND MOTIVATION 1
Well liked = RECOGNITION 1
Zeal = ENDURANCE AND MOTIVATION 1

ALPHABETICAL DICTIONARY OF INDEX TERMS

Format: The name of each index term is shown in all capital letters at the beginning of the definition of the term. The last section of the format presents a number of examples of how each term in the dictionary should be used. The number following each index term is the weight assigned to it by the indexer. Additional indexing rules may also be given.

COMMUNICATION refers to the expression of thoughts and feelings through the spoken or written word, and the quality of its use in the exchange of information within an organization. Includes public speaking, written documents, and consultations.

EXAMPLES:

- His use of the English language (COMM 3) is excellent and he expresses himself exceptionally well, both orally (COMM 3) and in writing (COMM 3).
- Ratee's ability to correctly speak (COMM 3) the English language is outstanding.
- Excellent knowledge of English language (COMM 3)
- Command of language (COMM 3) superb
- Grammar (COMM 3) excellent
- Vocabulary (COMM 3) is exceptional
- He utilizes a well-rounded vocabulary (COMM 1) to very effectively express (COMM 2) himself.
- Eloquent speaker (COMM 2)
- Expresses very well orally (COMM 2)
- He possesses an average command of the English language both orally (COMM 1) and in writing (COMM 1).
- He is capable of expressing (COMM 1) himself clearly and adequately.
- His reports (COMM 1) are accurate
- Expresses well in writing (COMM 1)
- Expresses well orally (COMM 1)
- Speaks with ease (COMM 1)
- Can converse easily (COMM 1)

COMMUNICATION (CONT.)

- Relaxed group speaker COMM 1
- Is at ease when speaking COMM 1
- Presents matter in a comprehensive and interesting manner COMM 1
- Speaks correctly COMM 1
- Speaks logically COMM 1
- Verbal expression is comprehensive COMM 1
- Capable in expressing himself COMM 1
- Uses communication to arouse interest, convince, and produce desired results. COMM 1 PTA 1
- He is soft spoken but speaks well; however, his written work, particularly spelling, could use improvement. COMM 1 COMM 1 COMM -1 COMM -1
- Difficulty speaking to large groups COMM -1

COMMUNICATION also is used when an individual communicates with his superiors for the purpose of exchanging information.

- He is an excellent administrator and skillful supervisor, and he keeps himself and his superiors fully informed of all facets of his branch's operation. MF 3 MF 1 MOF + TS 2 COMM 2
- He always keeps his superiors informed of any problems and the status of work in progress. COMM 2
- Ratee always consults with his Division Officer concerning his wishes on a matter, unless time is essential. COMM 2
- He keeps his seniors alerted to pending problems. COMM 1
- Keeps superior well informed. COMM 1

CONDUCT AND ATTITUDE refer to the way that one acts and behaves towards others, to one's self concept, and to the mental activities and attitudes that influence behavior. Includes moral principles, sincerity, loyalty, confidence, self-image, sense of humor, courage, flexibility, adjustability, appearance, grooming of one's self and one's clothing, maturity, stability, responsibility, levelheadedness, reliability, and dependability.

EXAMPLES:

- His conduct and personal appearance are always superb.
- Ratee reflects pride in his position as a Chief Petty Officer and provides an outstanding example through his exceptionally fine personal habits and dress under all circumstances.
- He provides an excellent example for his men.
- Chief's conduct is never questioned.
- He maintains an exemplary military appearance, and has high moral standards and a sound sense of values.
- Exemplary behavior
- He is always correct and proper in all relationships.
- His even disposition has proven an asset in maintaining an open channel of communication between instructor and student.
- Quick humor
- Good sense of humor
- Good example for his contemporaries
- Gentlemanly
- Enjoys his work
- At ease with superiors and subordinates
- Not afraid to offer criticism

CONDUCT AND ATTITUDE (CONT.)

- Bordered on insubordination

- The ratee has the potential to become an outstanding chief but has problems controlling his drinking while on the bench, resulting in tardiness at the expiration of liberty and his absence during working hours.

- Excesses in alcohol have led to tardiness and a question of his dependability.

It is important to remember that no matter how positive a trait may be, it is impossible to be consistent in weighting these traits; therefore, the weight is determined by the adjective which further qualifies the type of trait that an individual possesses. For example, cheerful or cheerful personality would be given a weight of 1, while very cheerful or a very cheerful personality would be given a weight of 2. The following personality traits and attitudes would all be indexed as CONDUCT AND ATTITUDE 1: optimistic attitude; pleasant attitude; takes pride in himself; pride in his work; pride in his performance; dignified; self-confident; upright; honest; sincere; does not procrastinate; spends not excessive time "visiting"; tactful; perfectionist; quiet; unselfish; firm; courage; courage of his convictions; composed; calm; courtesy; even disposition; obedience; loyalty to his superiors; friendly; agreeable; congenial; genial; amiable.

The way that a person grooms himself and cares for his attire reflects an attitude towards himself and towards others.

- Neat and polished appearance is in keeping with the highest Navy standards and serves as a criteria of excellence among the men with whom he comes in contact.

- His impeccable appearance leaves nothing to be desired.

- Wearing of uniform excellent

- Ratee's personal appearance is always correct and proper.

- He is always neat in appearance and his conduct is exemplary.

- His appearance is immaculate at all times.

- His appearance and dress is always correct, smart, and impressive.

CONDUCT AND ATTITUDE (CONT.)

- His uniform is consistently immaculate.

- Uniform (or dress) immaculate

- Grooming impeccable

- His dress is impressive, and is worn with care.

- He is tidy, intelligent, and obtains the best results from his men.

- He takes pride in his appearance

- Attention to his appearance

- Appearance military

- Shined shoes

- His tendency towards being overweight greatly detracts from his overall appearance.

Statements of an individual's adaptability and flexibility reflect a personality trait or attitude that affects behavior. However, if adaptability or flexibility are qualifiers for other concepts, do not index them. For example, "He is a very flexible organizer" would be indexed as ORGANIZATION AND STAFFING 2.

- His keen mind is alert to all possible circumstances, and he succeeds brilliantly in adjusting to new environments.

- Overall, he is a highly adaptable individual who exhibits unlimited potential and continuing high value to the U.S. Navy.

- He is a mature, stable Chief Petty Officer, intelligent, adaptable, and reliable.

- Adjusts quickly

- Flexible

- Open minded

CONDUCT AND ATTITUDE (CONT.)

- COND ▾ ATT 1 Open mind to criticism

Concepts of an individual being reliable, dependable, and responsible are indexed as CONDUCT AND ATTITUDE. However, if reliable or dependable is a qualifier for another concept, do not index it. For example, "His performance is reliable" would be indexed as PRODUCTIVITY AND ACHIEVEMENT 1, and "He is a reliable technician" would be indexed as PROFESSIONAL AND TECHNICAL SKILLS 1.

- He is completely COND ▾ ATT 2 reliable and has never COND ▾ ATT 3 showed case by action or word to the contrary.

- He never needs COND ▾ ATT 3 supervision

- He is E ▾ M 1 conscientious and is always extremely COND ▾ ATT 3 dependable.

- Fully realizes his COND ▾ ATT 2 responsibilities and at all times E ▾ M 2 consciously acts to fulfill them

- Ratee is COND ▾ ATT 2 very reliable.

- COND ▾ ATT 2 Completely reliable

- Always ready to act COND ▾ ATT 2 on his own

- Always ready to accept additional COND ▾ ATT 2 responsibility

- Ratee is COND ▾ ATT 1 punctual and can be COND ▾ ATT 1 depended upon to P ▾ A 1 perform well regardless of the amount of COND ▾ ATT 1 supervision.

- He can be COND ▾ ATT 1 depended upon to "get the P ▾ A 1 job done" with a minimum of COND ▾ ATT 1 supervision.

- Willing to assume or accept added COND ▾ ATT 1 responsibility

- Does not hesitate COND ▾ ATT 1 to accept work

- P ▾ A 1 Works well COND ▾ ATT 1 on his own

- He can be COND ▾ ATT 1 counted upon.

CONDUCT AND ATTITUDE (CONT.)

- P+A 1 COND + ATT 1 Job done without supervision
- COND + ATT 1 He needs no prodding or prompting.
- P+A 1 COND + ATT 1 Can work without direction
- COND + ATT 1 Required no supervision
- COND + ATT 1 Dependable
- COND + ATT 1 COND + RESP 1 Accepted responsibilities and authority
- E+M 1 COND + ATT 1 Eager acceptance of responsibility
- COND + ATT 1 Assumes added responsibilities
- COND + ATT -1 Ratee's inability to satisfactorily discharge his financial obligations shows a lack of responsibility.
- COND + ATT -1 Reluctance to assume new tasks
- COND + ATT -1 COND + ATT -1 Need for direction and checkup by superiors
- COND + ATT -1 Occasionally needs a reminder of particularly important jobs.
- COND + ATT -1 Relinquishes responsibility

If a reference is made to an individual's conduct as setting an example, it is assumed that "example" qualifies the conduct. Therefore, the phrases "exemplary behavior" or "his behavior is an example to all" or "...to his men" would be indexed as CONDUCT AND ATTITUDE 2 and CONDUCT AND ATTITUDE 1, respectively. However, if a reference is made to an individual leading by example, the "example" qualifies the leadership ability or the leadership role. For example, "He leads by example," would be indexed as LEADERSHIP AND DIRECTING 1.

COOPERATION AND RESPONSIVENESS refer to the specific conducts and attitudes that reflect the joint effort of acting or working with others and the quality of readily reacting to suggestion, instruction, or orders.

EXAMPLES:

- Ratee exemplifies the perfect officer-chief relationship. COOP ▼ RESP 3
- Never hesitates to fully cooperate COOP ▼ RESP 3
- Ratee is extremely cooperative in all his undertakings when given any task, and completes it in the most expeditious manner. COOP ▼ RESP 3 P ▼ A 3
- He always cooperates fully with his seniors and accomplishes his duties in an outstanding manner. COOP ▼ RESP 2 P ▼ A 3
- Ratee is very cooperative with his seniors and his contemporaries, always putting the interests of the Navy first. COOP ▼ RESP 2 E ▼ M 3
- He adds greatly to the morale of the division. COOP ▼ RESP 2
- Continuous cooperation in all aspects COOP ▼ RESP 2
- Complete cooperation COOP ▼ RESP 2
- He is a pleasure to work with. COOP ▼ RESP 1
- He will compromise. COOP ▼ RESP 1
- He will nevertheless listen to the ideas, beliefs, and suggestions of others. COOP ▼ RESP 1
- Gets along well with others COOP ▼ RESP 1
- Assists others COOP ▼ RESP 1
- He is quick to respond to any situation or problem and to find a solution. COOP ▼ RESP 1 P - C 1
- He uncomplainingly responds when called upon to meet unscheduled commitments, frequently under adverse conditions. COOP ▼ RESP 1 E ▼ M 1

COOPERATION AND RESPONSIVENESS (CONT.)

COOP + RESP 1 COOP + RESP 1 E + M 2

- He is responsive and agreeable to demands upon him and constantly seeks ways of improving working L + D 1 conditions and L + D 1 morale.

COOP + RESP -1

- Uncooperative

Usually an individual's interpersonal relationship with his subordinates would be indexed as LEADERSHIP AND DIRECTING. However, when a statement has to do with an individual's "cooperative" attitude or "working well" with others, whether superiors or subordinates, then it should be labeled COOPERATION AND RESPONSIVENESS.

COOP + RESP 2

- He is always willing to help others in any way he can.

COOP + RESP 1

- Works well with superiors and subordinates

COOP + RESP 1

- Cooperative with superiors and subordinates

COOP + RESP 1 L + D 1

- Willing to help superiors and subordinates

L + D 1

- Willing to help his subordinates

Concepts about an individual's response to authority, commands, rules, and regulations are indexed as COOPERATION AND RESPONSIVENESS.

COOP + RESP 1

- He accepts authority in stride.

COOP + RESP 1

- Adheres to established rules and regulations

COOP + RESP 1

- Obeys all commands and regulations

COOP + RESP 1

- Accepts authority without question

CREATIVITY AND INITIATIVE refer to the ability to create, initiate, or originate ideas or tasks; characterized by being innovative, inventive, or imaginative. This concept is always indexed even when it is qualifying another concept.

EXAMPLES:

- His personal appearance, cooperative attitude, and initiative leave virtually nothing to be desired.
- He is extremely reliable and never fails to take the initiative in difficult situations.
- He displays an outstanding example in ingenuity.
- Ratee displays considerable initiative in accomplishing each task assigned.
- Provided Division officer with many ideas
- Ratee possesses a keen mind, is capable of original thinking, and expresses his thoughts well and decisively when communicating with others.
- Ratee is proficient in anticipating situations in his area of responsibility and initiates action to cope with them.
- His imagination allows him to find new and different solutions to problems which others do not seem to be able to solve.
- Volunteering his own views
- Making suggestions (recommendations)
- An original thinker
- Inventive
- Personal initiative

CREATIVITY AND INITIATIVE (CONT.)

- Ratee undertakes his duties willingly but lacks the initiative that is required of the very best in his rate.
- However, at times he lacks the initiative and drive that is necessary to produce these results.

ENDURANCE AND MOTIVATION refer to the specific conducts and attitudes that reflect the inner desire and drive for self-improvment and to achieve or complete tasks, as well as the ability to function under conditions of fatigue, distress, stress, and/or pain. Includes motivation towards the military, forceful, conscientious, energetic, enthusiasm, dedication, devotion, aggressive, diligent, dynamic, ambitious, zeal, endeavor, can-do attitude or spirit, volunteering for work, taking courses.

EXAMPLES:

- He is an exceptionally dedicated (E↑M 3) and hard working (E↑M 3) Chief, readily accepting (COND↑ATT 1) and expeditiously solving (P-C 1) problems.
- He continually strives (E↑M 3) for perfection.
- He is extremely dedicated (E↑M 3) to his division, department, and ship.
- The ratee always has the best interests of the Navy (E↑M 3) in mind.
- Dedicated (E↑M 3) to perfection
- His endurance (E↑M 3) is outstanding.
- Always driving (E↑M 2) to do the best job (P↑A 3) possible.
- His ability to maintain an inner calm (COND↑ATT 1) and to function efficiently during periods of great confusion (E↑M 2) and stress suit him ideally (S↑A 3) to his present assignment.
- This highly energetic (E↑M 2) and enthusiastic (E↑M 2) young petty officer has performed (P↑A 3) all aspects of his duties in an outstanding fashion.
- Completely dedicated (E↑M 2) Chief Petty Officer
- Attempts (E↑M 2) to achieve perfection
- Strives (E↑M 2) for perfection
- Ratee performs (P↑A 1) with vigor (E↑M 1).
- He is conscientious (E↑M 1) and is always extremely dependable (COND↑ATT 3).

ENDURANCE AND MOTIVATION (CONT.)

- During the previous deployment he demonstrated his ability to function smoothly and effectively under adverse and demanding conditions for extended periods.

- Positive attitude towards Navy

- He is first one in the office each morning and usually has worked for an hour each morning before the commencement of ship's work.

- He takes pride in his uniform.

- Pride in his unit or in the Navy

- Loyal to the Command

- He uncomplainingly responds when called upon to meet unscheduled commitments, frequently under adverse conditions.

- Performs well under stress

- Persistence in the face of adversity

- He is a dedicated career man who displays pride in the Navy and the Squadron.

- Dedication (devotion) to duty

- Although the tasks assigned to the personnel under his supervision are always completed efficiently and in an excellent to outstanding manner, his superiors feel that he is capable of getting more out of his men and of putting more of himself into the job.

- Ratee is not as aggressive as he could be which subsequently detracts from him reaching his full potential.

The following words and phrases would be indexed as ENDURANCE AND MOTIVATION 1: unflagging effort; dedicates or devotes long hours; tireless; taking courses in off-duty hours; determined; works hard; applied himself; strives for improvment; working long hours; aggressive pursuit of duties; can-do spirit or attitude; diligent; dynamic; ambitious; zeal; endeavor;

ENDURANCE AND MOTIVATION (CONT.)

volunteers for work; indefatigable; perserverance; fortitude; persistence; tenacity; willing to work long hours; willing worker; makes an effort.

The following words and phrases would be indexed as ENDURANCE AND MOTIVATION 2: works very hard at his job; spends many extra hours at his job; devotes many off-duty hours; always willing to work long hours whenever necessary; continuously strives; taking many courses in off-duty hours; devotes many long hours.

When a statement about drive is part of how an individual is performing a specific function or skill, then the statement would be indexed with both concepts.

- Desire for excellence in his own and subordinates' work
- Ratee works very hard at motivating his men to improve their performance.
- Ratee is constantly seeking to improve the productivity of the work center.
- Very dedicated manager
- He constantly strives to improve his overall proficiency.
- Strives to do his very best at each job undertaken.
- Aggressive leader

INTELLECTUAL FUNCTIONING is the ability to learn or understand from experience, and the ability to analyze, reason, and perceive relationships and differences. A measurement of intellectual functioning would be a scholastic record.

EXAMPLES:

- He completed all courses with very high grades, usually leading his class.
- Ratee is extremely keen minded.
- He learns quickly and applies his training and experience effectively.
- He is a forceful and intelligent Career Petty Officer who has such command of the basic professional techniques that he can direct his actions to job perfection and the well-being of his subordinates.
- He is tidy, intelligent, and obtains the best results from his men.
- Coherent mental organization
- Coherence of his thoughts
- Analytical mind
- Alert (when not used as a qualifier for another term)
- Common sense
- Insight

LEADERSHIP AND DIRECTING refer to the motivating, guiding, and supervising of subordinates to accomplish a job and work towards improved performance. Includes encouraging subordinates in cooperative endeavors and also in self-development through counseling. Includes the possession of leadership qualities that can influence and affect others.

EXAMPLES:

- His excellent leadership qualities were especially manifest [when he was assigned to lead the maintenance efforts of CQ. detachments in CONSTELLATION and INDEPENDENCE.]

- Gets the most out of his men

- Best results from his men

- Chief has demonstrated the potential to be an outstanding leader.

- He spent a great deal of extra time with his men and turned out well trained, very motivated men for the fleet.

- High regard for men

- High expectations from men

- Ratee's knowledge of the S-2E Electronic System is outstanding, and he is able to utilize this exceptional knowledge through skillful management of shop personnel and an innate ability to pass along what he knows to others.

- Ratee handles his men in an effective manner and always gets good results from his subordinates.

- Ratee has the ability to solve problems and motivate people.

- His loyalty was shown in the conscientious manner in which he attended to the problems of his men.

- Molded crew into a competent and effective team

- Encourages and guides subordinates

LEADERSHIP AND DIRECTING (CONT.)

- L▼D 1 Helped men advance in rate
- L▼D 1 Leadership ability
- L▼D 1 His men are hard working.
- L▼D 1 Performs well as a leader
- L▼D -1 He appears to be indifferent to the personnel administration of his men, especially in regard to special requests and advancement.
- Although the tasks assigned to the personnel under his supervision are always completed efficiently and in an excellent to L▼D 3 outstanding manner, his superiors feel that he is capable of getting more out of L▼D -1 his men and of putting more of E▼M -1 himself into the job.
- L▼D -1 Lack of leadership
- E▼M -1 L▼D -1 Needs more forceful approach to leadership

LEADERSHIP AND DIRECTING also would be creating an atmosphere that makes teamwork possible, such as improving working conditions. A measure would be morale.

- L▼D 2 Promotes (inspires or promotes) high morale
- COMP▼LESP 2 Contributes to high morale
- L▼D 2 High shop esprit
- L▼D 2 High regard for team concept
- L▼D 1 Promotes harmony and accord
- L▼D 1 His men are cheerful.
- L▼D 1 No disciplinary problems

LEADERSHIP AND DIRECTING include all of those activities which are designed to encourage subordinates to work effectively and efficiently. This is reflected in the way in which the individual being evaluated relates to his subordinates.

LEADERSHIP AND DIRECTING (CONT.)

L▼D 1
- He is tactful with his subordinates.

L▼D 1
- Tact in handling subordinates

The rapport that an individual has with his subordinate divisional personnel would be indexed with LEADERSHIP AND DIRECTING. However, an individual's interpersonal relationship with his peers or superiors probably would be indexed by one of the following terms: CONDUCT AND ATTITUDE; or COOPERATION AND RESPONSIVENESS. The rapport that an individual has with other organizational units affects his division's work and, therefore, the index term REPRESENTATION would be used. There are two exceptions where the relationship between an individual and his subordinates would not be indexed as LEADERSHIP AND DIRECTING. When the statement has to do with an individual's cooperative attitude or "working well" with others---superiors or subordinates (and not his eliciting cooperation from others), use the index term COOPERATION AND RESPONSIVENESS. For example, "He is cooperative with superiors and subordinates," would be indexed COOPERATION AND RESPONSIVENESS 1. The other exception is a statement about the men's respect or regard for the individual. For example, both "his men trust him," and "the men are loyal to him," would be indexed by the term RECOGNITION 1.

COOP ▼ RESP 1
- Works well with superiors and subordinates

COOP ▼ RESP 1
- Cooperative with superiors and subordinates

COOP ▼ RESP 1 L▼D 1
- Willing to help superiors and subordinates

L▼D 1
- Willing to help his subordinates

A manager in his leadership role must act his part and be conscious of the impact of his behavior on his men. For example, "He leads by example," would be indexed as LEADERSHIP AND DIRECTING 1. However, if a reference is made to an individual's conduct as setting an example, it is assumed that "example" qualifies the conduct and does not refer to the individual's leadership ability since no reference is made to his leadership role. Therefore, the phrases "exemplary behavior" or "his behavior is an example to all" or "...to his men" would be indexed as CONDUCT AND ATTITUDE 2 and CONDUCT AND ATTITUDE 1, respectively.

L▼D 1
- Leads by setting the example

L▼D 1
- Mindful of his position as a leader

The words supervising, directing, or managing can apply to tasks, men, or both. The indexer has to judge what the evaluator means. It usually can

LEADERSHIP AND DIRECTING (CONT.)

be assumed that supervising refers to overall managerial functions or tasks (MANAGEMENT FUNCTIONS), unless stated or inferred otherwise. If the statement refers to the supervising, directing, or managing of men only, then use LEADERSHIP AND DIRECTING.

- Consistent in direction of personnel L▼D /
- Directs men well L▼D /
- Finds time to direct and counsel young men L▼D / L▼D /
- Skilled at managing his men L▼D /

MANAGEMENT FUNCTIONS refer to those job duties which are characteristic of all managers: leadership and directing, organization and staffing, planning-controlling, and representation. Though operations may differ from one organization to another, the functions of the manager are common to all. When the specific managerial function is mentioned in the narrative text, use the more specific index term under MANAGEMENT FUNCTIONS in the hierarchy.

EXAMPLES:

- He is an excellent manager (MF 3) and organizer (O+S 3) who is willing to accept any assignment no matter how difficult. (COND + ATT 1)

- Chief has made a prime contribution (P+A 2) to the ship through his excellent supervision (MF 3) of the Fuel Oil and Water Testing Laboratory and the Oil Kings.

- He is well versed (PROF + TS 1) in the 3-M System and always exhibits sound management (MF 2) practices.

- Ratee's superior leadership (L+D 3) capabilities and overall knowledge of management (MF 1) greatly contributed to this division receiving (P+A 3) a grade of 4.0 during the annual administrative inspection.

- BTC has an excellent working (PROF + TS 3) and practical (PROF + TS 3) knowledge of the PMS System but has a tendency to be lax in the administrative (MF -1) phase of the system.

The words supervising, directing, or managing can apply to tasks or to men. The indexer has to judge what the evaluator means. It usually can be assumed that supervising refers to the overall managerial functions or tasks, unless stated or inferred otherwise. If the statement refers to the supervising, directing, or managing of men only, then use LEADERSHIP AND DIRECTING.

- He has demonstrated superior performance in supervising (MF 3) equipment, maintenance, operation and repair.

- His administrative (MF 1) knowledge and ability to supervise (L+D 1) and coordinate (O+S 1) the efforts of other instructors enabled this command to develop all the material (P+A 1) required for realistic support of the E2B Aircraft.

ORGANIZATION AND STAFFING refer to the establishment of an intentional structure of roles through the determination and enumeration of activities required to achieve enterprise goals, and the manning of and keeping manned these roles or positions.

EXAMPLES:

Organization includes grouping activities and roles, delegating authority, and coordinating authority relationships.

If an individual sets up a liaison with another organizational unit or division within the Navy or an outside organization, the index term ORGANIZATION AND STAFFING would be used. However, if an individual uses the liaison or organizational structure that is already set up to enhance his division's working relationship with other organizational units, the index term REPRESENTATION would be used.

- He does an excellent job of planning, organizing, and carrying out his job.
- He has developed an extremely tightly knit division which has an uncommon amount of pride in its work.
- Excellent job setting up the operation
- His ability to assign workload in a smooth fashion is noteworthy.
- He is a highly motivated and aggressive individual with a good sense of organization and administrative ability.
- Ratee spends a very limited time in the shop but has exerted a spirit of independence in his First Class, the result being a well organized and efficient shop.
- He is a professional administrator and understands the principles of delegation.
- The ratee's ability to work with others, his capacity for organization and stimulating enthusiasm makes him a valuable asset to any unit.
- He reorganized the work center.
- Set up a file on each item

ORGANIZATION AND STAFFING (CONT.)

- Ability to coordinate O+S1
- Coordinates work centers O+S1
- Coordination of work duties O+S1
- His initiative at times lags, and he tends to undertake too many tasks alone rather than delegating them to subordinates. CREAT + INIT -1 O+S-1 O+S-1

Staffing includes the appraisal or assessment of personnel to see if they are suited to a role or position, and the training of personnel with the aim of having them carry out their roles as defined by the organizational structure. Periodic appraisal of personnel is made to determine how the personnel are carrying out their roles and to assess whether further training is necessary or whether promotions are warranted.

- His instructions are presented in such a manner that maximum training is accomplished in the time alloted. COMM1 O+S3
- He spent a great deal of extra time with his men and turned out well trained, well motivated men for the fleet. E+M2 L+D1 O+S1 L+D1
- He is continually researching the available training and ensuring that assigned personnel have what is needed. O+S2 P-C2
- Ratee has tutored division personnel in all aspects of the Navy publications system. O+S1
- His men re-enlist. O+S1

PLANNING-CONTROLLING refers to the decision-making process involving the selection among alternatives of objectives, policies, and programs; and the means for achieving and assuring the accomplishment of plans. Control which involves the accomplishment of plans is assured by measuring permance against established standards or goals and correcting deviations or taking action that prevents deviations from occurring. Planning-control systems involve establishing and maintaining objectives or goals; policies; methods, ways, or procedures; rules; programs; budgets; strategies; schedules; and feedback mechanisms such as maintaining inventory-traffic flow patterns, checks and balances, bookkeeping, and accounting systems.

EXAMPLES:

- He does an excellent job of planning, organizing, and carrying out his job.
- His ability to seek out potential problems and correct them before failure occurred has been extremely beneficial.
- He is consistently capable of resolving problem areas before a critical situation can develop.
- In his capacity as water chief tender he has enforced a strict and professional water chemistry program.
- He is methodical, deliberate, and able to develop effective and efficient procedural methods of accomplishing the division workload.
- Ratee's resourcefulness in setting up a procedure to instruct 150 recruits daily in this very difficult operation was largely responsible for the efficient operation of the matches.
- He had the ability and initiative to plan and assign work to personnel under his direction to ensure that the end results are of the highest quality.
- His analysis of divisional problems, both functional and administrative, and the execution of corrective measures have been very conducive to a smooth and highly effective division.
- Found new ways to improve the security of the Communications building

PLANNING-CONTROLLING (CONT.)

- P-C 1 Good decision maker
- P-C 1 Shows judgment
- P-C 1 Improves plans
- P-C 1 Has alternate plans
- P-C 1 Solves problems
- P-C 1 Prevents problems
- P-C 1 Corrects difficulties
- P-C -2 Because he never examined the fireroom equipment during the 10 days in port, the P-A -1 unsatisfactory condition of the boilers went unchecked.

If the correction, problem solving, or prevention is of a technical nature and is performed solely by an individual instead of by a group of his subordinates, it should be regarded more as a technical function or the demonstration of a technical skill rather than considered to be a controlling function, and would be labeled TECHNICAL SKILLS. *For example, "Ratee's knowledge of the P-3 aircraft electronic systems and his ability to expeditiously correct the most complex electronic problem is outstanding," would be indexed* PROFESSIONAL AND TECHNICAL SKILLS 3; PROFESSIONAL AND TECHNICAL SKILLS 3. *The modifying adverb* <u>outstanding</u> *belongs to both phrases of this sentence.*

PRODUCTIVITY AND ACHIEVEMENT refer to the accomplishment and accomplishing of a desired result achieved through an individual's performance of his overall job duties as a manager. Included here are statements referring to the ongoing performance of an individual in executing his job duties as a manager that has led to desired results in the past or that is expected to produce desired results.

EXAMPLES:

- P-A 3 He carries out his mission to the best of his ability.
- P-A 3 Ratee's performance is outstanding in all aspects.
- P-A 3 Performance in both his primary and secondary billets has been outstanding in all aspects as marked in block 19.
- P-A 3 Always works to his fullest potential
- P-A 3 Never allowed shop to wane
- P-A 3 Handled duties in an outstanding manner
- P-A 3 He never leaves a job unfinished.
- P-A 3 His thoroughness in performing his duty is outstanding.
- P-A 3 Outstanding in his work
- P-A 3 He has the ability to perform in an outstanding manner.
- P-A 3 No error noted
- P-A 3 Meets responsibilities in a minimum of time
- P-A 2 Every assignment is performed with unusual accuracy and effectiveness.
- Under his supervision the shop has met and surpassed the accepted norm of P-A 2 productivity.
- P-A 2 RM 1 has hit his stride and surpassed even his previously high standards.
- P-A 2 Impressive discharge of duty

PRODUCTIVITY AND ACHIEVEMENT (CONT.)

- Performed remarkably well
- Production over the past six months has been about average for a two-man station.
- Tested and proven under fire
- Success in a difficult task
- His technical competence and resourcefulness contributes to ships in tending to maintain operational readiness.
- His performance has been commensurate with his rate.
- Capable of handling a demanding job in an efficient manner
- He performs his job as radio supervisor in a conscientious and reliable manner.
- He performs in a capable manner.
- Assignments are completed (or completes assigned tasks).
- Chief is a performer.
- Has seen these tasks through to their successful completion
- Carries out all assignments expediently and efficiently
- Efforts bring success
- Overcomes obstacles
- He meets his responsibilities and quotas in a timely manner (or ahead of schedule).
- While he was acting as ship's Oil King, the ship witnessed three oil spills while refueling.

PRODUCTIVITY AND ACHIEVEMENT (CONT.)

- His extremely poor performance of his duties led directly to the ship's boilers not being in a state of operational readiness.

Statements of improvement should be indexed as PRODUCTIVITY AND ACHIEVEMENT if they are in terms of overall performance.

- Made significant improvements
- Made improvements
- Enabled him to improve
- Yielded benefits
- Room for improvement
- Expected to improve

It is important to make certain that the achievement was not a personal technical accomplishment, in which case PROFESSIONAL AND TECHNICAL SKILLS would be used.

- Ratee single-handedly tore down and rebuilt an engine in 16 hours so the ship would be ready for the cruise.

Use PRODUCTIVITY AND ACHIEVEMENT if an award is given to an individual's squadron, command, or other such unit. For example, "He contributed directly to the annual OP-EVAL award of 'Outstanding' given this division by the DCA Inspection Team during their recent visit to this Command." PRODUCTIVITY AND ACHIEVEMENT 3. RECOGNITION would be used if the award had been given to the ratee.

- It is also noted that he has been selected for the NARTU Lakehurst "Sailor of the Quarter" award because of his outstanding continuous record of achievement.
- BTC was given an achievement medal for his leadership efforts during the 1969 WESTPAC Cruise.

PROFESSIONAL AND TECHNICAL SKILLS refer to the experience, knowledge, and the understanding and demonstration of techniques and technical skills in a specified role. Includes professional, professionalism, technical knowledge, expertise, technical background, knowledge of the responsibilities of rate, understanding of job duties, technical experience.

If a specific function or behavior is qualified by the above concept and there is an appropriate term in the hierarchy, then the label indicating the specific function or behavior, such as MANAGEMENT FUNCTIONS, would be used. The concept of professional and technical skills would be considered to be a qualifier for the label used. However, when the above concept modifies a reference to a skill, ability, or qualification in a specific role for which there is no label in the hierarchy, use the term PROFESSIONAL AND TECHNICAL SKILLS. SKILLS AND ABILITIES would only be used for a general reference to a skill and not to a skill in a specified role. For example:

PROF + TS 3
- Extremely effective ET

COND + ATT 1
- Professional attitude

COND + ATT 1
- Professional behavior

M F 1
- Professional administrator

L+D 1
- Knowledgeable leader

S+A 1
- He is skilled.

PROF + TS 1
- Professional skill

PROF + TS 1
- Versatile Instructor

PROF + TS 1
- Knowledgeable Radioman

PROF + TS 1
- Ability to teach

EXAMPLES:

PROF + TS 3
- Ratee has consistently demonstrated his outstanding professional qualifications.

PROF + TS 3
- The ratee has an outstanding knowledge of all Electrical Drone Systems in the squadron aircraft.

PROFESSIONAL AND TECHNICAL SKILLS (CONT.)

- BTC has an excellent working and practical knowledge of the PMS system, but has a tendency to be lax in the administrative phase of the system.

- These accomplishments were achieved through high professionalism, enthusiasm, and superior decision-making ability.

- His expertise is widely acknowledged.

- As an Airborne Communications Supervisor, ratee's professional competence has contributed to flight operation, excellent mission performance, and praise for his division.

- Ratee single-handedly tore down and rebuilt an engine in 16 hours so the ship would be ready for the cruise.

- His performance reflects competence and professionalism.

- He is well versed in the 3-M System and always exhibits sound management practices.

- His technical competence and resourcefulness contribute to ships in tending to maintain operational readiness.

- Professional knowledge

- He knows what is expected of him.

- Chief was relieved of his duties as the ship's Oil King after serving in the capacity for approximately two months. He was removed from this billet because of his lack of professional knowledge and technical know-how in the art of refueling.

When an individual is in the process of acquiring new knowledge or a new skill, it would be an indication of his motivation and be labeled as ENDURANCE AND MOTIVATION. *The indexer should not use* PROFESSIONAL AND TECHNICAL SKILLS *unless the individual has finished the course and, therefore, already has the knowledge or skill.*

PROFESSIONAL AND TECHNICAL SKILLS (CONT.)

- He is a very knowledgeable technician who attempts to keep constantly abreast of current changes by devoting his off duty time to the study of technical and nontechnical material through evening college courses.

PROF - TS 2 E - M 2 E - M 1

- Keeps well informed on supply procedures

PROF - TS 1

- Keeps up with changes in publications

PROF - TS 1

RECOGNITION refers to the acknowledgment made by others of an individual's standing in relation to his worth or value to the Navy, an organizational unit, and/or the men with whom he works.

EXAMPLES:

- He possesses the character, personality, and desire that commands the highest respect and admiration from his associates.
- He was given an excellent overall grade.
- This action has generated the highest degree of trust and confidence with his superiors.
- He is well liked and highly respected by juniors and seniors alike, and his easy-going manner and pleasant congeniality make him at home in any surroundings.
- Ratee is highly regarded by all of his men.
- He has their full respect and gets it.
- Inspires respect
- Expertise widely acknowledged and respected by others
- Gains the genuine respect
- He expresses himself clearly and logically and his views are respected by those with whom he works.
- He readily obtains the confidence of all who come in contact with him.
- Men trust him/loyal to him
- Praised/popular
- Justified others' confidence in him
- Commands respect and gets it
- His advice is sought by others because of his technical skill.

RECOGNITION (CONT.)

- His concern for his men has won the respect of his subordinates. LTD 1 REC 1
- Merits the respect REC 1
- I would welcome him in my crew anytime. REC 1
- Generates respect/respected by REC 1 REC 1

If an individual is considered to be an asset or credit to the service, then use RECOGNITION. However, if one of his traits or skills is an asset to the Navy or in performing a task, then use "asset" as a qualifier for the trait or skill. For example, "His cooperative nature is a great asset to the Navy." COOPERATION AND RESPONSIVENESS 2. Statements about reflecting credit upon the Navy would be indexed as REPRESENTATION.

- Ratee has been an exceptionally fine asset to this command. REC 3
- One of the most outstanding men in the Navy today REC 3
- He is an outstanding military man. REC 3
- He is valuable to any command. REC 2
- He is a valuable asset to the service. REC 2
- He is a great value to the U.S. Navy. REC 2
- He has been a great asset to DESCOL and the Navy. REC 2
- Able to handle varied jobs and hence is a very valuable Chief S-A 1 REC 2
- Reported in a commendatory way REC 1
- Ratee has proven to be a definite asset with his outstanding professional and instructional ability in a relatively short time. REC 1 PROF + TS 3 PROF + TS 3
- He is an asset to the ship and the naval service. REC 1
- He is a credit to the Navy. REC 1
- He is a credit to the squadron. REC 1

RECOGNITION (CONT.)

- He is an asset to the command of the Navy.

- He is an asset to high morale.

RECOGNITION includes an official award or punishment, or the recommendation for such an award or penalty, which would be assigned a weight of either 3 or -2, respectively. Use RECOGNITION only once no matter how many awards an individual received if they are all mentioned in one statement. For example, "He won five awards for outstanding performance last year," would be indexed as RECOGNITION 3, PRODUCTIVITY AND ACHIEVEMENT 3.

Use PRODUCTIVITY AND ACHIEVEMENT if an award is given to an individual's squadron, command, or other such unit. For example, "He contributed directly to the annual OP-EVAL award of 'Outstanding' given this division by the DCA Inspection Team during their recent visit to this Command." PRODUCTIVITY AND ACHIEVEMENT 3. RECOGNITION would be used if the award had been given to the individual.

- It is also noted that he has been selected for the NARTU Lakehurst "Sailor of the Quarter" award because of his outstanding continuous record of achievement.

- BTC was given an achievement medal for his leadership efforts during the 1969 WESTPAC Cruise.

- Awarded the Navy Commendation Medal for meritorious service while attached to Fighter Squadron ONE FIVE ONE embarked in USS CORAL SEA (CVA-43) during combat operations from 10 October 1968 to 30 March 1969

- He was awarded an oral admonition.

- Relieved of duties

RECOGNITION also is embodied in statements recommending an individual or acknowledging that an individual is suited for a rank increase, advancement, promotion, or added responsibilities.

- Ratee's performance in the past was responsible for his selection from every First Class and Chief Petty Officer in this command as Command Career Counselor.

- He would be most valuable in an instructor billet assignment.

RECOGNITION (CONT.)

- He is highly recommended for advancement. REC 2
- He is highly recommended for advancement and retention in the Naval Reserve. REC 2 REC 2
- Strongly recommended for promotion REC 2
- Outstanding potential for added responsibility S+A 3 REC 1
- He is qualified to assume the greater responsibility of the next higher pay grade. S+A 1 REC 1
- Ratee is fully qualified for advancement in rate. S+A 2 REC 1
- Ratee is very knowledgeable in the supply system and is recommended for E-8. PROF + TS 2 REC 1
- Eminently well qualified for advancement S+A 2 REC 1
- Capable of assuming more responsibility S+A 1 REC 1
- Has passed the exam, but was not advanced PROF + TS 1 REC -1

REPRESENTATION refers to the creation of an image of an organization to the external or internal environment. An organizational unit's image affects its working relationship with other organizational units within the U.S. Navy and/or with the community outside of the organizational structure.

Some management experts do not consider REPRESENTATION to be a separate managerial function. However, in this dictionary it is considered to be a separate function because of the importance given to relating to the civilian community by naval personnel.

EXAMPLES:

- He is an outstanding representative of the Navy in all respects. REP 3
- Ratee has been very successful in improving his Branch Station's relations with local high schools and youth organizations. REP 2
- The appearance of this building is a fine example and reflection of the Navy to the visiting civilians. REP 2
- He is an active Navy promoter and is the first to step forward to educate subordinates on Navy policy, procedure, or benefits. REP 1 O+S 3
- He takes an active part in church and civic programs, helping to uphold the Navy image in the community. REP 1 REP 1
- Active in extracurricular activities REP 1
- Takes part in extracurricular activities REP 1
- Public relations for his branch REP 1
- Status of his branch or job area REP 1

The rapport that an individual has with other organizational units also enhances his division's work, and the index term REPRESENTATION would be used. The rapport that an individual has with his divisional personnel probably would be indexed by either LEADERSHIP AND DIRECTING or COOPERATION AND RESPONSIVENESS.

If an individual sets up a liaison with another organizational unit or division within the Navy or an outside organization, the index term ORGANIZATION AND STAFFING would be used. However, if an individual uses the liaison or organizational structure that is already set up to enhance his division's working relationship with other organizational units, the index term REPRESENTATION would be used.

REPRESENTATION (CONT.)

A statement about an individual reflecting credit upon the Navy would be labeled as REPRESENTATION.

P&A 3 E+M 3 E+M 3

- His achievements, loyalty, and devotion to duty are in keeping with the highest traditions of the Armed Forces and reflect great credit upon himself and the United States Navy. REP 2

- Reflects credit on the Navy REP 1

- Brings credit to the Navy REP 1

- Is a credit to the Navy REC 1

SKILLS AND ABILITIES are those characteristics and qualities that influence a person's performance in the attainment of goals and results. If the type of skill and/or ability is specified, and there is an appropriate term in the hierarchy, use the more specific term.

EXAMPLES:

- There is nothing that can arise in his present position or next assignment that ratee cannot cope with. S↓A 3
- This man is extremely competent. S↓A 3
- He is able to direct the efforts of Line Personnel in an efficient and effective manner; this is reflected in the ratee by a multiple of exceptional qualities. L↓D 1 S↓A 3
- Above average in all areas, he is fully qualified to assume the greater responsibility of the next higher rank. S↓A 2 S↓A 2 REC 1
- He daily demonstrates all of the highly desirable traits of a Chief Petty Officer. S↓A 2
- Ratee is very meticulous and thorough. S↓A 2 S↓A 2
- Capable of handling any situation that may arise S↓A 2
- Is able to handle varied jobs and hence is a very valuable Chief S↓A 1 REC 2
- His natural abilities and responsible approach to recruiting have enabled the ratee to outperform his contemporaries. S↓A 1 COND↓ATT 1 P↓A 2
- With more time and conscientious effort, he should realize a greater potential. E↓M -1 S↓A -1

SKILLS AND ABILITIES is a catchall term for those concepts that stand alone and do not qualify other dimensions which have their own indexing term in the hierarchy. For example, "a skillful person" would be indexed as SKILLS AND ABILITIES, but "managerial skills" would be labeled with the index term MANAGEMENT FUNCTIONS.

- Extremely effective ET PROF↓TS 3
- Exceptionally well qualified S↓A 3

SKILLS AND ABILITIES (CONT.)

- Outstanding individual — S ▼ A 3
- Has many skills — S ▼ A 2
- Well-qualified Supervisor — M F 1
- Proficient manager — M F 1
- Proficient individual — S ▼ A 1
- Proficient Chief Petty Officer — S ▼ A 1
- Able leader — L ▼ D 1
- Able person — S ▼ A 1
- Skilled technician — PROF ▼ TS 1
- Skilled manager — M F 1
- Skilled Radioman — PROF ▼ TS 1
- Skilled Instructor — PROF ▼ TS 1
- Experienced Instructor — PROF ▼ TS 1

The following terms would be labeled SKILLS AND ABILITIES if they were not qualifying another concept for which there is an index term: resourceful, potential, qualities, skills, traits, attention to detail, efficient, effective, proficient, accurate, meticulous, thorough, methodical, competent, capable, and talented.

DISTRIBUTION LIST

NAVY

4 Dr. Marshall J. Farr, Director
Personnel and Training Research Programs
Office of Naval Research
Code 458
Arlington, VA 22217

1 ONR Branch Office
495 Summer Street
Boston, MA 02210
ATTN: Research Psychologist

1 ONR Branch Office
1030 East Green Street
Pasadena, CA 91101
ATTN: Dr. E. E. Gloye

1 ONR Branch Office
536 South Clark Street
Chicago, IL 60605

1 Office of Naval Research
Area Office
207 West 24th Street
New York, NY 10011

6 Director
Naval Research Laboratory
Code 2627
Washington, DC 20390

12 Defense Documentation Center
Cameron Station, Building 5
5010 Duke Street
Alexandria, VA 22314

1 Special Assistant for Manpower
OASN (M&RA)
Pentagon, Room 4E794
Washington, DC 20350

1 LCDR Charles J. Theisen, Jr., MSC, USN
Code 4024
Naval Air Development Center
Warminster, PA 18974

1 Chief of Naval Reserve
Code 3055
New Orleans, LA 70146

1 Navy Personnel Research and Development Center
Code 9041
San Diego, CA 92152
ATTN: Dr. J. D. Fletcher

1 Dr. Lee Miller
Naval Air Systems Command
AIR-413E
Washington, DC 20361

1 Commanding Officer
U.S. Naval Amphibious School
Coronado, CA 92155

1 Chief
Bureau of Medicine & Surgery
Research Division (Code 713)
Washington, DC 20372

1 Chairman
Behavioral Science Department
Naval Command & Management Division
U.S. Naval Academy
Luce Hall
Annapolis, MD 21402

1 Chief of Naval Education & Training
Naval Air Station
Pensacola, FL 32508
ATTN: CAPT Bruce Stone USN

1 Mr. Arnold Rubinstein
Naval Material Command
NAVMAT 03424
Room 820, Crystal Plaza #6
Washington, DC 20360

1 Commanding Officer
Naval Medical Neuropsychiatric Research Unit
San Diego, CA 92152

1 Director, Navy Occupational Task Analysis Program (NOTAP)
Navy Personnel Program Support Activity
Building 1304, Bolling AFB
Washington, DC 20336

1 Dr. Richard J. Niehaus
Office of Civilian Manpower Management
Code 06A
Washington, DC 20390

1 Department of the Navy
Office of Civilian Manpower Management
Code 263
Washington, DC 20390

1 Chief of Naval Operations
OP-987E
Department of the Navy
Washington, DC 20350

1 Superintendent
Naval Postgraduate School
Monterey, CA 93940
ATTN: Library (Code 2124)

1 Commander, Navy Recruiting Command
4015 Wilson Boulevard
Arlington, VA 22203
ATTN: Code 015

1 Mr. George N. Graine
Naval Ship Systems Command
SHIPS 047C12
Washington, DC 20362

1 Chief of Naval Technical Training
Naval Air Station Memphis (75)
Millington, TN 38054
ATTN: Dr. Norman J. Kerr

1 Dr. William L. Maloy
Principal Civilian Advisor for Education & Training
Naval Training Command
Code 01A
Pensacola, FL 32508

1 Dr. Alfred F. Smode
Staff Consultant
Training Analysis & Evaluation Group
Naval Training Equipment Center
Code N-00T
Orlando, FL 32813

1 Dr. Hanns H. Wolff
Technical Director (Code N-2)
Naval Training Equipment Center
Orlando, FL 32813

1 Chief of Naval Training Support
Code N-21
Building 45
Naval Air Station
Pensacola, FL 32508

1 Navy Personnel Research and Development Center
San Diego, CA 92152

5 Navy Personnel Research and Development Center
San Diego, CA 92152
ATTN: Code 10

1 CAPT D. M. Gragg, MC, USN
Head, Educational Programs Development Department
Naval Health Sciences Education & Training Command
Bethesda, MD 20014

ARMY

1 Headquarters
U.S. Army Administration Center
Personnel Administration Combat Development Activity
ATCP-HRO
Ft. Benjamin Harrison, IN 46249

1 Armed Forces Staff College
Norfolk, VA 23511
ATTN: Library

1 Commandant
United States Army Infantry School
ATTN: ATSH-DET
Ft. Benning, GA 31905

1 Deputy Commander
U.S. Army Institute of Administration
Ft. Benjamin Harrison, IN 46216

1 Dr. Stanley L. Cohen
U.S. Army Research Institute
1300 Wilson Boulevard
Arlington, VA 22209

1 Dr. Ralph Dusek
U.S. Army Research Institute
1300 Wilson Boulevard
Arlington, VA 22209

1 Dr. J. E. Uhlaner
Technical Director
U.S. Army Research Institute
1300 Wilson Boulevard
Arlington, VA 22209

1 HQ USAREUR & 7th Army
ODCSOPS
USAREUR Director of GED
APO New York 09403

AIR FORCE

1 Research Branch
AF/DPMYAR
Randolph AFB, TX 78148

1 Dr. G. A. Eckstrand
AFHRL/AS
Wright-Patterson AFB
OH 45433

1 AFHRL/DOJN
Stop #63
Lackland AFB, TX 78236

1 Dr. Robert A. Bottenberg
AFHRL/SM
Stop #63
Lackland AFB, TX 78236

1 Dr. Martin Rockway
AFHRL/TT
Lowry AFB, CO 80230

1 Major P. J. DeLeo
Instructional Technology Branch
AF Human Resources Laboratory
Lowry AFB, CO 80230

1 AFOSR/NL
1400 Wilson Boulevard
Arlington, VA 22209

1 Commandant
USAF School of Aerospace Medicine
Aeromedical Library (SUL-4)
Brooks AFB, TX 78235

1 CAPT Jack Thorpe, USAF
Flying Training Division (HRL)
Williams AFB, AZ 85224

1 AFHRL/PE
Stop #63
Lackland AFB, TX 78236

MARINE CORPS

1 Mr. E. A. Dover
Manpower Measurement Unit
Code MPI
Arlington Annex, Room 2413
Arlington, VA 20380

1 Commandant of the Marine Corps
Headquarters, U.S. Marine Corps
Code MPI-20
Washington, DC 20380

1 Director, Office of Manpower Utilization
Headquarters, Marine Corps
Code MPU
MCB (Building 2009)
Quantico, VA 22134

1 Dr. A. L. Slafkosky
Scientific Advisor (Code RD-1)
Headquarters, U.S. Marine Corps
Washington, DC 20380

1 Chief, Academic Department
Education Center
Marine Corps Development & Education Command
Marine Corps Base
Quantico, VA 22134

COAST GUARD

1 Mr. Joseph J. Cowan, Chief
Psychological Research Branch
G-P-1/62
U.S. Coast Guard Headquarters
Washington, DC 20590

OTHER DOD

1 Lt. Col. Henry L. Taylor, USAF
Military Assistant for Human Resources
OAD (E&LS) ODDR&E
Pentagon, Room 3D129
Washington, DC 20301

1 Col. Austin W. Kibler
Advanced Research Projects Agency
Human Resources Research Office
1400 Wilson Boulevard
Arlington, VA 22209

1 Dr. Harold F. O'Neil, Jr.
Advanced Research Projects Agency
Human Resources Research Office
1400 Wilson Boulevard, Room 625
Arlington, VA 22209

1 Helga L. Yeich
Advanced Research Projects Agency
Manpower Management Office
1400 Wilson Boulevard
Arlington, VA 22209

OTHER GOVERNMENT

1 Dr. Lorraine D. Eyde
Personnel Research and Development Center
U.S. Civil Service Commission
1900 E. Street, N.W.
Washington, DC 20415

1 Dr. William Gorham, Director
Personnel Research and Development Center
U.S. Civil Service Commission
1900 E. Street, N.W.
Washington, D.C. 20415

1 Dr. Vern Urry
Personnel Research and Development Center
U.S. Civil Service Commission
1900 E. Street, N.W.
Washington, DC 20415

1 Dr. Andrew R. Molnar
Technological Innovations in Education
National Science Foundation
Washington, DC 20550

1 U.S. Civil Service Commission
Federal Office Building
Chicago Regional Staff Division
ATTN: C. S. Winiewicz
Regional Psychologist
230 So. Dearborn Street
Chicago, IL 60604

MISCELLANEOUS

1 Dr. Scarvia B. Anderson
Educational Testing Service
17 Executive Park Drive, N.E.
Atlanta, GA 30329

1 Dr. John Annett
The Open University
Milton Keynes
Buckinghamshire
ENGLAND

1 Dr. Gerald V. Barrett
University of Akron
Department of Psychology
Akron, OH 44325

1 Dr. Bernard M. Bass
University of Rochester
Management Research Center
Rochester, NY 14627

1 Mr. Kenneth M. Bromberg
Manager - Washington Operations
Information Concepts, Inc.
1701 North Fort Myer Drive
Arlington, VA 22209

1 Century Research Corporation
4113 Lee Highway
Arlington, VA 22207

1 Dr. Kenneth E. Clark
University of Rochester
College of Arts & Sciences
River Campus Station
Rochester, NY 14627

1 Dr. Norman Cliff
University of Southern California
Department of Psychology
University Park
Los Angeles, CA 90007

1 Dr. Rene' V. Dawis
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 Dr. Ruth Day
Yale University
Department of Psychology
New Haven, CT 06520

1 Dr. Norman R. Dixon
Room 170
190 Lothrop Street
Pittsburgh, PA 15260

1 Dr. Robert Dubin
University of California
Graduate School of Administration
Irvine, CA 92664

1 Dr. Marvin D. Dunnette
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 ERIC
Processing and Reference Facility
4833 Rugby Avenue
Bethesda, MD 20014

1 Dr. Victor Fields
Montgomery College
Department of Psychology
Rockville, MD 20850

1 Dr. Edwin A. Fleishman
American Institutes for Research
Foxhall Square
3301 New Mexico Avenue, N.W.
Washington, DC 20016

1 Dr. Robert Glaser, Director
University of Pittsburgh
Learning Research & Development Center
Pittsburgh, PA 15213

1 LCol CRJ Lafleur, Director
Personnel Applied Research
National Defence HQ
Ottawa, Canada K1A OK 2

1 Mr. Harry H. Harman
Educational Testing Service
Princeton, NJ 08540

1 Dr. Richard S. Hatch
Decision Systems Associates, Inc.
11428 Rockville Pike
Rockville, MD 20852

1 Dr. M. D. Havron
Human Sciences Research, Inc.
7710 Old Spring House Road
West Gate Industrial Park
McLean, VA 22101

1 HumRRO
Division No. 3
P.O. Box 5787
Presidio of Monterey, CA 93940

1 HumRRO
Division No. 4, Infantry
P.O. Box 2086
Ft. Benning, GA 31905

1 HumRRO
Division No. 5, Air Defense
P.O. Box 6057
Ft. Bliss, TX

1 HumRRO
Division No. 6, Library
P.O. Box 428
Ft. Rucker, IL 36360

1 Dr. Lawrence B. Johnson
Lawrence Johnson & Associates, Inc.
200 S. Street, N.W., Suite 502
Washington, DC 20009

1 Dr. Steven W. Keele
University of Oregon
Department of Psychology
Eugene, OR 97403

1 Dr. David Klahr
Carnegie-Mellon University
Department of Psychology
Pittsburgh, PA 15213

1 Dr. Frederick M. Lord
Educational Testing Service
Princeton, NJ 08540

1 Dr. Ernest J. McCormick
Purdue University
Department of Psychological Sciences
Lafayette, IN 47907

1 Dr. Robert R. Mackie
Human Factors Research, Inc.
6780 Cortona Drive
Santa Barbara Research Park
Goleta, CA 93017

1 Mr. Edmond Marks
405 Old Main
Pennsylvania State University
University Park, PA 16802

1 Dr. Leo Munday
Vice-President
American College Testing Program
P.O. Box 168
Iowa City, IA 52240

1 Mr. A. J. Pesch, President
Eclectech Associates, Inc.
P.O. Box 178
North Stonington, CT 06359

1 Mr. Luigi Petrullo
2431 North Edgewood Street
Arlington, VA 22207

1 Dr. Joseph W. Rigney
University of Southern California
Behavioral Technology Laboratories
3717 South Grand
Los Angeles, CA 90007

1 Dr. Leonard L. Rosenbaum, Chairman
Montgomery College
Department of Psychology
Rockville, MD 20850

1 Dr. George E. Rowland
Rowland and Company, Inc.
P.O. Box 61
Haddonfield, NJ 08033

1 Dr. Arthur I. Siegel
Applied Psychological Services
404 East Lancaster Avenue
Wayne, PA 19087

1 Dr. Richard Snow
Stanford University
School of Education
Stanford, CA 94305

1 Dr. C. Harold Stone
1428 Virginia Avenue
Glendale, CA 91202

1 Mr. Dennis J. Sullivan
725 Benson Way
Thousand Oaks, CA 91360

1 Dr. Benton J. Underwood
Northwestern University
Department of Psychology
Evanston, IL 60201

1 Dr. Robert Vineberg
HumRRO Western Division
27857 Berwick Drive
Carmel, CA 93921

1 Dr. David J. Weiss
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 Dr. Anita West
Denver Research Institute
University of Denver
Denver, CO 80210